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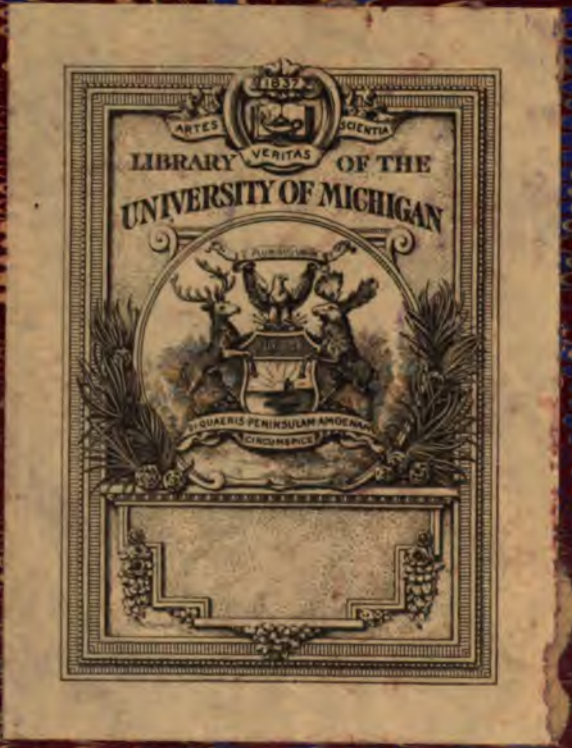

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PART III.

APPENDIX R.

REPORT OF MAJOR JAMES B. QUINN, CORPS OF ENGINEERS.

INSPECTION of the improvement of the South Pass of the Mississippi River, 1795.

APPENDIX S.

REPORT OF MAJOR JAMES B. QUINN, CORPS OF ENGINEERS.

IMPROVEMENTS.—Chefuncte River and Bogue Falia, La., 1808; Tickfaw River an
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APPENDIX T.

REPORT OF CAPTAIN JOHN MILLIS, CORPS OF ENGINEERS.

IMPROVEMENT.—Securing mouth of Bayou Plaquemine, La., from further caving, 1857.

APPENDIX U.

REPORT OF MAJOR A. M. MILLER, CORPS OF ENGINEERS.

IMPROVEMENTS.—Entrance to Galveston Harbor, Tex., 1861; Ship Channel in Galveston Bay, Tex., 1872; channel in West Galveston Bay, Tex., 1877; Trinity River, Tex., 1880; Cedar Bayou, Tex., 1883; Buffalo Bayou, Tex., 1886; harbor at Brazos Santiago, Tex., 1890;

EXAMINATION.—Brazos River, Tex., from its mouth to Richmond, 1893.

APPENDIX V.

REPORT OF CAPT. J. H. WILLARD, CORPS OF ENGINEERS.

IMPROVEMENTS.—Red River, La. and Ark., 1901; Red River above Fulton, Ark., 1999; Ouachita and Black rivers, Ark. and La., 2002; Bayous D'Arbonne and Corney, La., 2009; Bayou Bartholomew, La. and Ark., 2012; Boeuf River, La., 2015: Tensas River and Bayou Maçon, La., 2018; Big Black River, Miss., 2022; Yazoo River, Miss., 2024; mouth of the Yazoo River, Miss., 2029; Tchula Lake, Miss., 2038; Tallahatchee River, Miss., 2041; Steele and Washington bayous, Miss., 2045; Big Sunflower River, Miss., 2047; Big Hatchee River, Tenn., 2052; Forked Deer River, Tenn., 2054; water gauges on Mississippi River and its principal tributaries, 2057; survey of Cypress Bayou and the lakes between Jefferson, Texas, and Shreveport, La., 2065.

EXAMINATIONS.—Sulphur River, Tex., 2083; Little River, Ark., 2087; Ouachita River above Camden, Ark., 2091; Cassity Bayou, Miss., 2095; Coldwater River, Miss., 2099.

APPENDIX W.

REPORT OF CAPT. H. S. TABER, CORPS OF ENGINEERS.

IMPROVEMENTS.—Removing obstructions in Arkansas River, 2102; Arkansas River, 2103; Fourche Le Fevre River, Ark., 2108; Petit Jean River, Ark., 2110; White River, Ark., 2111; Cache River, Ark., 2114; Little Red River, Ark., 2115; Black River, Ark. and Mo., 2116; Black River, Mo., 2117; St. Francis River, Ark., 2118; St. Francis River, Mo., 2119; Little River, Mo., removing sunken vessels or craft obstructing or endangering navigation, 2121.

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REPORT OF CAPT. S. W. ROESSLER, CORPS OF ENGINEERS.

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REPORT OF MAJOR CHAS. J. ALLEN, CORPS OF ENGINEERS.

IMPROVEMENTS.—Removing snags and wrecks from Mississippi River, 2139; Mississippi River between Ohio and Missouri rivers, 2147; harbor at St. Louis, Mo., 2177; Gasconade River, Mo., 2178; Osage River, Mo., 2182; Kaskaskia River, Ill., 2185.

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IMPROVEMENTS.—Operating snagboats and dredgeboats on upper Mississippi River, 2189; Mississippi River between Missouri River and Minneapolis, 2200; Des Moines Rapids, Mississippi River, 2240; operating and care of Des Moines Rapids Canal and Drydock, 2241.

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Examinations.—Mississippi Sound, 1783; Back Bay, Biloxi, Miss., 1784; mouth Old Fort Bayou, Miss., mouth of Wolf River, Miss., 1787; mouth of Jordan Riv Miss., 1789; Pearl River from Edinburg to Lake Burnside, Miss., 1791; divers of Pearl River near Jackson, Miss., through Tan Yard Branch, 1792.

PART III.

APPENDIX R.

REPORT OF MAJOR JAMES B. QUINN, CORPS OF ENGINEERS.

Inspection of the improvement of the South Pass of the Mississippi River, 1795.

APPENDIX S.

REPORT OF MAJOR JAMES B. QUINN, CORPS OF ENGINEERS.

Improvements.—Chefuncte River and Bogue Falia, La., 1808; Tickfaw River a its tributaries, La., 1810; Amite River and Bayou Manchac, La., 1812; Bay Lafourche, La., 1814; Bayou Terrebonne, La., 1817; Bayou Plaquemine, Gra River, and Pigeon bayous, La., 1818; Bayou Courtableau, La., 1821; Bayou Tec La., 1824; channel, bay, and passes of Bayou Vermillion, La., 1826; Mermen River and tributaries, La., 1828; mouth and passes of Calcasieu River, La., 18 harbor at Sabine Pass, Tex., 1832; Sabine River, Tex., 1835; Neches River, Te 1837; removing sunken vessels or craft obstructing or endangering navigatio 1839.

Examinations.—Homochitto River, Miss., 1839; harbor of refuge on Lake Po chartrain, La., 1842; connection of bayous Black and Terrebonne between Sout down Plantation and Houma, La., 1845; Sabine River from Sudduths Bluff, Tex to Logansport, La., 1848; channel through Sabine Lake from Sabine Pass to mout of Sabine and Neches rivers, Tex., 1850; Neches River, Tex., from its mouth Shooks Bluff, 1853.

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EXAMINATION.—Brazos River, Tex., from its mouth to Richmond, 1893.

APPENDIX V.

REPORT OF CAPT. J. H. WILLARD, CORPS OF ENGINEERS.

IMPROVEMENTS.—Red River, La. and Ark., 1901; Red River above Fulton, Ark., 1999; Ouachita and Black rivers, Ark. and La., 2002; Bayous D'Arbonne and Corney, La., 2009; Bayou Bartholomew, La. and Ark., 2012; Boeuf River, La., 2015: Tensas River and Bayou Maçon, La., 2018; Big Black River, Miss., 2022; Yazoo River, Miss., 2024; mouth of the Yazoo River, Miss., 2029; Tchula Lake, Miss., 2038; Tallahatchee River, Miss., 2041; Steele and Washington bayous, Miss., 2045; Big Sunflower River, Miss., 2047; Big Hatchee River, Tenn., 2052; Forked Deer River, Tenn., 2054; water gauges on Mississippi River and its principal tributaries, 2057; survey of Cypress Bayou and the lakes between Jefferson, Texas, and Shreveport, La., 2065.

EXAMINATIONS.—Sulphur River, Tex., 2083; Little River, Ark., 2087; Ouachita River above Camden, Ark., 2091; Cassity Bayou, Miss., 2095; Coldwater River, Miss., 2099.

APPENDIX W.

REPORT OF CAPT. H. S. TABER, CORPS OF ENGINEERS.

IMPROVEMENTS.—Removing obstructions in Arkansas River, 2102; Arkansas River, 2103; Fourche Le Fevre River, Ark., 2108; Petit Jean River, Ark., 2110; White River, Ark., 2111; Cache River, Ark., 2114; Little Red River, Ark., 2115; Black River, Ark. and Mo., 2116; Black River, Mo., 2117; St. Francis River, Ark., 2118; St. Francis River, Mo., 2119; Little River, Mo., removing sunken vessels or craft obstructing or endangering navigation, 2121.

EXAMINATIONS.—Saline River, Ark., 2122; Fourche Le Fevre River, Ark., 2125; Current River, Ark., 2128.

APPENDIX X.

REPORT OF CAPT. S. W. ROESSLER, CORPS OF ENGINEERS.

EXAMINATIONS.—Harbor at Memphis, Tenn., including removal of bar forming opposite the upper part of the city, and bank protection along the city front, 2133; Wolf River, Tenn., 2136.

APPENDIX Y.

REPORT OF MAJOR CHAS. J. ALLEN, CORPS OF ENGINEERS.

IMPROVEMENTS.—Removing snags and wrecks from Mississippi River, 2139; Mississippi River between Ohio and Missouri rivers, 2147; harbor at St. Louis, Mo., 2177; Gasconade River, Mo., 2178; Osage River, Mo., 2182; Kaskaskia River, Ill., 2185.

APPENDIX Z.

REPORT OF MAJOR ALEXANDER MACKENZIE, CORPS OF ENGINEERS.

IMPROVEMENTS.—Operating snagboats and dredgeboats on upper Mississippi River, 2189; Mississippi River between Missouri River and Minneapolis, 2200; Des Moines Rapids, Mississippi River, 2240; operating and care of Des Moines Rapids Canal and Drydock, 2241.

EXAMINATIONS.—Hamburg Bay, on Mississippi River, Calhoun County, Ill., 2248; Mississippi River, Iowa side, from mouth of Iowa River to Burlington, 2251; Moline Harbor, Ill., 2253; Mississippi River at and near Bellevue, Iowa, 2254; additional harbors of refuge on Lake Pepin, Mississippi River, 2257.

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REPORT OF MAJOR A. M. MILLER, CORPS OF ENGINEERS.

IMPROVEMENTS.—Entrance to Galveston Harbor, Tex., 1861; Ship Channel in Galveston Bay, Tex., 1872; channel in West Galveston Bay, Tex., 1877; Trinity River, Tex., 1880; Cedar Bayou, Tex., 1883; Buffalo Bayou, Tex., 1886; harbor at Brazos Santiago, Tex., 1890;

EXAMINATION.—Brazos River, Tex., from its mouth to Richmond, 1893.

APPENDIX V

REPORT OF CAPT. J. H. WILLARD, CORPS OF ENGINEERS.

IMPROVEMENTS.—Red River, La. and Ark., 1901; Red River above Fulton, Ark., 1999; Ouachita and Black rivers, Ark. and La., 2002; Bayous D'Arbonne and Corney, La., 2009; Bayou Bartholomew, La. and Ark., 2012; Boeuf River, La., 2015: Tensas River and Bayou Maçon, La., 2018; Big Black River, Miss., 2022; Yazoo River, Miss., 2024; mouth of the Yazoo River, Miss., 2029; Tchula Lake, Miss., 2038; Tallahatchee River, Miss., 2041; Steele and Washington bayous, Miss., 2045; Big Sunflower River, Miss., 2047; Big Hatchee River, Tenn., 2052; Forked Deer River, Tenn., 2054; water gauges on Mississippi River and its principal tributaries, 2057; survey of Cypress Bayou and the lakes between Jefferson, Texas, and Shreveport, La., 2065.

EXAMINATIONS.—Sulphur River, Tex., 2083; Little River, Ark., 2087; Ouachita River above Camden, Ark., 2091; Cassity Bayou, Miss., 2095; Coldwater River, Miss., 2099.

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EXAMINATIONS.—Saline River, Ark., 2122; Fourche Le Fevre River, Ark., 2125; Current River, Ark., 2128.

APPENDIX X.

REPORT OF CAPT. S. W. ROESSLER, CORPS OF ENGINEERS.

EXAMINATIONS.—Harbor at Memphis, Tenn., including removal of bar forming opposite the upper part of the city, and bank protection along the city front, 2133; Wolf River, Tenn., 2136.

APPENDIX Y.

REPORT OF MAJOR CHAS. J. ALLEN, CORPS OF ENGINEERS.

IMPROVEMENTS.—Removing snags and wrecks from Mississippi River, 2139; Mississippi River between Ohio and Missouri rivers, 2147; harbor at St. Louis, Mo., 2177; Gasconade River, Mo., 2178; Osage River, Mo., 2182; Kaskaskia River, Ill., 2185.

APPENDIX Z.

REPORT OF MAJOR ALEXANDER MACKENZIE, CORPS OF ENGINEERS.

IMPROVEMENTS.—Operating snagboats and dredgeboats on upper Mississippi River, 2189; Mississippi River between Missouri River and Minneapolis, 2200; Des Moines Rapids, Mississippi River, 2240; operating and care of Des Moines Rapids Canal and Drydock, 2241.

EXAMINATIONS.—Hamburg Bay, on Mississippi River, Calhoun County, Ill., 2248; Mississippi River, Iowa side, from mouth of Iowa River to Burlington, 2251; Moline Harbor, Ill., 2253; Mississippi River at and near Bellevue, Iowa, 2254; additional harbors of refuge on Lake Pepin, Mississippi River, 2257.

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TO THE

REPORT OF THE CHIEF OF ENGINEERS,

UNITED STATES ARMY.

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APPENDIX G.

IMPROVEMENT OF RIVERS AND HARBORS IN SOUTHERN NEW JERSEY, OF DELAWARE RIVER AND BAY, AND OF WATERS TRIBUTARY THERETO, NEW JERSEY, PENNSYLVANIA, AND DELAWARE.

REPORT OF MAJ. C. W. RAYMOND, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1893, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

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2. Harbor between Philadelphia, Pa., and Camden, N. J.
3. Schuylkill River, Pennsylvania.
4. Ice harbor at Marcus Hook, Pennsylvania.
5. Ice harbor at head of Delaware Bay, Delaware.
6. Construction of iron pier in Delaware Bay, near Lewes, Del.
7. Delaware Breakwater, Delaware.
8. Rancocas River, New Jersey.
9. Alloway Creek, New Jersey.
10. Salem River, New Jersey.
11. Goshen Creek, New Jersey.
12. Removing sunken vessels or craft obstructing or endangering navigation.

EXAMINATIONS.

13. Barnegat Inlet, New Jersey.
14. Dennis Creek, New Jersey.
15. Cooper Creek, New Jersey.

UNITED STATES ENGINEER OFFICE,
Philadelphia, Pa., July 8, 1893.

GENERAL: I have the honor to transmit herewith the annual reports for the works of river and harbor improvement in my charge for the fiscal year ending June 30, 1893.

Very respectfully, your obedient servant,

C. W. RAYMOND,
Major, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

G 1.

IMPROVEMENT OF DELAWARE RIVER, NEW JERSEY AND PENNSY VANIA.

The project for this improvement, from Philadelphia to the sea, based upon the report of a board of engineers, dated January 2 1885, and published in the Annual Report of the Chief of Enginee for 1885. It provides for the formation of a permanent channel 26 fe deep at mean low water and 600 feet wide at all points where a le depth and width exist between deep water in Delaware Bay and point about midway between the American Shipbuilding Compan yard and the Gas Trust Wharf, in the city of Philadelphia, by dikin dredging, and rock removal.

The project for the improvement of the river between Trenton a Bridesburg was approved February 28, 1890, and is published in t Annual Report of the Chief of Engineers for 1890. It provides for t formation of a channel 12 feet deep at mean low water over Kinko Bar by the construction of a dike and dredging.

Expenditures during the past fiscal year have been applied to t following operations:

1. Examinations and surveys at Burlington Island, Kinkora Ba Five Mile Bar, Mifflin Bar, Schooner Ledge, and Baker Shoal.
2. Improvement and examination of Cherry Island Flats.
3. Improvement and survey of Bulkhead Bar.

These operations will be described in the above order.

1. EXAMINATIONS AND SURVEYS.

Burlington Island.—This island is situated about 19 miles above Phil delphia. Under date of February 6, 1893, the Board of Wardens f the port of Philadelphia passed a resolution requesting the removal the bar below Burlington Island opposite Bristol. Under date March 13, 1893, the burghers and council of Bristol borough passe resolutions containing the same request, and on March 15 and June 2 1893, petitions with the same object were received from the busines men of Bristol and the owners of steamboats navigating the river abov Philadelphia. These papers are appended hereto.

From an examination of this locality made in June, 1893, it appea that since 1886 the foot of Burlington Island has moved downstrea the low-water line having advanced about 300 feet, the 6-foot curve depth about 400 feet, and the 12-foot curve about 100 feet. The tot cross-section of the river near Burlington has materially decrease The nucleus of this formation is said to have been material former dumped in the river.

The main ship channel still preserves a greater depth than that esta lished in the adopted project of 1890, the minimum depth at mean lo water being 13.3 feet, but its width is somewhat diminished. The effe of the changes above indicated has been to seriously incommode th cross-river traffic between Burlington and Bristol, making a long deto necessary in place of the more direct route formerly followed. If th main ship channel continues to decrease in width its navigation wi become difficult.

Kinkora Bar.—This locality is situated in the reach of river betwee Trenton, N. J., and Bridesburg, Pa., and about 25 miles above the foo of Market street, Philadelphia. In its natural condition Kinkora Ba carried a ruling depth of 7½ feet at mean low water and formed th only obstruction to a 12-foot low-water channel as far up river as White hill, or to within 5 miles of Trenton.

During the year 1890 a dike was built partly closing the slough south of Newbold Island, and a channel with a depth of 12 feet at mean low water and a width of about 175 feet was dredged across the bar, as provided in the project of 1890. The dike was repaired in 1892.

This improvement has not proved permanent. At the close of the fiscal year ending June 30, 1892, the channel had shoaled considerably, the minimum low-water depth across the bar being about 8 feet. From an examination made at the close of the past fiscal year it appears that shoaling is still in progress, the minimum low-water depth in the channel being now about 7½ feet.

This part of the river is exposed to the vigorous action of ice and freshets and the channel dimensions are constantly changing. Its permanent improvement at a reasonable cost is therefore considered impracticable.

Five Mile Bar.—This obstruction lies directly above the upper end of Petty Island, in the port of Philadelphia. The works existing for its improvement consist of a dike extending from the New Jersey shore at Fishers Point to within 2,000 feet of the head of Petty Island. At the close of the fiscal year ending June 30, 1890, the dike had reached an extension of 4,500 linear feet, of which the upper 3,500 linear feet consisted of a random stone dike founded upon a brush-mattress sill and backed with gravel and bowlders derived from the excavation of the channel at Port Richmond, and the lower 1,000 linear feet of a pile dike filled with stone. The tops of these constructions were carried to a height of 2 feet above mean high water. This dike has not been extended during the past three years.

At the close of the fiscal year of 1892 the action of the dike had formed a channel from 12 to 13 feet deep at mean low water and from 200 to 300 feet wide across the bar. An examination made in June, 1893, shows that there is now a channel from 12 to 15 feet deep and 200 feet wide across the bar, that the flood channel north of the bar has moved slightly upstream, and that the ebb channel south of the bar has moved downstream. The changes are generally favorable.

Mifflin Bar.—This obstruction lies about 10 miles below Philadelphia. The existing works for its improvement consist of a random-stone dike upon a brush-mattress foundation extending from the Pennsylvania shore at Hog Island to the head of Maiden Island, a distance of 7,200 feet. The object of the dike is the improvement of the main ship channel over Mifflin Bar by the concentration of the tidal currents. The dike was commenced in 1885 and completed to the height of mean low water in September, 1888. Since that date no additions have been made to the work.

At the close of the fiscal year of 1892 the channel across the bar, dredged in 1888, carried a mean low-water depth of 25 feet over a width of 200 feet, and a depth of 24 feet over a width of 350 feet. An examination made in June, 1893, shows that the channel has shoaled, the greatest depth completely across the bar being now 24.4 feet at mean low water. The 24-foot channel has now a minimum width of 150 feet. The deposit of material behind the dikes, which is now in progress, will probably assist in the maintenance of this channel, but it is believed that the dike will have to be raised above high water to give the channel reasonable permanency.

Schooner Ledge.—At a point about 18 miles below Philadelphia the main ship channel was originally obstructed by a ledge of rock known as Schooner Ledge, which reduced the depth at mean low water to about 18 feet.

In 1879 the formation of a channel was commenced through this obstruction and continued until 1884, when a channel was reported a formed to a depth of 24 feet at mean low water for a width of 330 fee Subsequently other obstructions were discovered, and in 1889, 250 cubi yards of sand and rock were removed from the shoal area. In the sam year a detailed survey was made to determine the exact condition c the channel, but owing to the difficulty of finding with certainty isc lated points with the lead some obstructions remained undiscovered.

On February 20, 1893, the German tank steamship *Elsie Mari* drawing about 24½ feet aft, grounded in this locality on the range, a or near high-water slack, indicating unknown obstructions in the char nel. At the request of the board of port wardens of Philadelphia th channel was carefully examined by sweeping, and the location an character of the obstructions were determined by a diver during Ma 1893.

These examinations show that the obstructions consist of broke rock or bowlders, some of which may be lost buoy sinkers, and thre points of a solid ledge over which the minimum depth is 22½ feet a mean low water. As these hard obstructions are very dangerous t navigation, it is proposed to make a still closer examination and sub mit a project for their removal as soon as possible.

Baker Shoal.—This shoal is situated about 48 miles below Philadel phia and just below Reedy Island. It forms a serious obstruction i the main ship channel, carrying a depth of only 20 feet at mean lo water. The improvement, as proposed by the Board of Engineers o 1884, is to be accomplished by a dike nearly 5 miles in length, extend ing from the lower end of Reedy Island to a point on the right bank o the river below the mouth of Blackbird Creek.

The construction of this dike was commenced in 1887 and continue until December, 1889. During this interval the dike was raised to th level of mean low water over a distance of about 6,000 feet. The metho of construction employed is described in the Annual Report of th Chief of Engineers for 1890. Since 1889 no work has been done on thi dike, as the necessities of commerce required the immediate improve ment of the channel at Bulkhead Bar, where the results of the wor were expected to furnish valuable information for the continuation o the improvement at Baker Shoal.

During the fiscal year of 1892 a detailed survey of the channel in thi locality was made to determine the changes in progress and to furnis the basis for a project for the continuation of the improvement. Thi survey was plotted during the past fiscal year and the project is no under consideration. The survey shows that very little change ha occurred since the survey of 1880.

2. IMPROVEMENT AND EXAMINATION OF CHERRY ISLAND FLATS.

These flats are situated about 24 miles below Philadelphia and jus above the mouth of the Christiana River. They lie in mid-stream, sep arating two channels, neither of which had originally sufficient dept for the purposes of commerce. The western channel had an averag low-water depth of about 19 feet.

The formation of a channel west of the flats, having a width of abou 470 feet and a depth of 24 feet at mean low water, was commenced i 1879 and completed in 1884, the length of the cut being nearly 2 miles In this work 1,594,740 cubic yards of material were removed by dredg ing, at a cost of $400,000.

The general project for the improvement of the river provides for th widening of this channel to 600 feet and an increase of depth to 26 fee at mean low water. Frequent examinations since 1884 show that th cut shoals very slowly, so that it is more economical to maintain it by dredging at long intervals than by the construction of dikes. An examination made during May, 1892, shows that the channel had shoaled about 1.2 feet over a distance of about 10,000 feet.

A project for continuing the improvement of the channel in this locality was submitted on July 15, 1892, and approved on July 20, 1892. It provides for the formation of a channel 26 feet deep at mean low water with a width of 500 feet, at an estimated cost of $100,000.

Under date of September 6, 1892, contract for the execution of this work was entered into with the American Dredging Company, of Philadelphia. Work under this contract was commenced on September 19, 1892, and is still in progress. At the close of the past fiscal year 669,630 cubic yards of material, scow measurement, had been removed by dredging. This material was deposited in shallow water on the east side of the flats in order to reduce the cross section at this point.

During May, 1893, an examination was made to determine what changes had resulted from the action of ice and other causes during the past winter, which was of unusual severity. It appears that there have been considerable changes in the bottom, but no shoaling was found in the recently-dredged area.

3. IMPROVEMENT AND SURVEY OF BULKHEAD BAR.

This locality is situated about 36 miles below Philadelphia, or about 3 miles above Fort Delaware. In its unimproved condition the shoal carried from 20 to 21 feet at mean low water, and although the channel across the bar had been repeatedly deepened by dredging, it soon returned to its original condition, and formed the most marked obstruction to commerce in the navigation of the river between Philadelphia and the sea.

The project of the Board of Engineers of 1884 for the improvement of this locality proposed the construction of a random stone dike, about 14,000 feet in length, brought to the height of mean low water and extending along the easterly side of Bulkhead Shoal from the upper end of Pea Patch Island upstream, in a curved line approximately parallel to the New Jersey shore opposite.

For reasons given in the Annual Report of the Chief of Engineers for 1890, p. 872, a project was submitted and approved May 15, 1890, in which pile dikes filled with stone were substituted for the previously proposed random stone dikes, and east and west dikes in place of the single dike along the west side of the channel.

The east dike was commenced on August 25, 1890, and completed on June 30, 1892. Its total length, including the shore extension, was 4,063 feet. In 1891 and 1892, 51,810 cubic yards of material were removed from the channel by dredging.

At the close of the fiscal year 1892, there was a channel across the bar having a minimum depth of 24 feet at mean low water, with a least width of 370 feet, and a minimum depth of 26 feet at mean low water, with a least width of 100 feet, and favorable changes were in progress. The flood channel on the west side of the bar had advanced upstream, showing no deflection towards the Delaware shore. The commencement of the construction of the west dike was considered undesirable at that time, since it would not be required should the flood channel continue to deepen along the same direction.

During the past fiscal year the exposed end of the dike was strengthened and repaired by depositing $532\frac{620}{2240}$ tons of large stone in the head and around its base, the work being done under an open-market agreement with the Brandywine Granite Company, at a total cost of

$1,330.69. Two breaks in the dike, caused by an unknown vessel running into it, were repaired under an open-market agreement with I. H. Hathaway & Co., at a total cost of $519.78.

The amount of ice which formed in the Delaware River during last winter was much greater than has been known for many years. In the latter part of January an enormous ice field moved on the flood tide, and, pivoting on the end of the dike, swung completely around into the channel above. The end of the dike being unsupported on the upper side, a length of about 86 feet was forced out of position and completely wrecked. A project for the repair and strengthening of this exposed end was submitted on May 12, 1893, and approved May 15, 1893. The work has been advertised and will be executed during the present season.

While the ice pack was in the river the directions of the tidal currents were strongly influenced by great ice dikes extending for several miles above and below the dike and along the upper end of Pea Patch Island. It is therefore difficult to determine the influence of the dike from a study of the changes in the channel. A survey made in April, 1893, shows that the width of the 26-foot channel over the crest of the bar has been fully maintained. Farther upstream the width has slightly decreased, a result which may be due to a deflection of the flood current by the ice barrier on Pea Patch Island, and which could scarcely have been produced by the influence of the dike. The flood channel on the west side of the bar has continued its upward movement without deflection towards the Delaware shore. While the condition of this locality is very satisfactory, the permanency of the improvement can not yet be considered as fully established.

The Delaware River is tributary to the following collection districts: Trenton, Philadelphia, Wilmington, and Bridgeton.

The amount of revenue collected in these districts during the year ending December 31, 1892, was $10,897,670.38.

APPROPRIATIONS.

Act of—		Act of—	
July 4, 1836	$15,000	March 3, 1881	$250,000
June 10, 1872	10,000	August 2, 1882	286,000
March 3, 1873	115,000	July 5, 1884	200,000
June 23, 1874	60,000	August 5, 1886	210,000
March 3, 1875	30,000	August 11, 1888	250,000
August 14, 1876	40,000	September 19, 1890	240,000
June 18, 1878	110,000	July 13, 1892	50,000
March 3, 1879	201,000		
June 14, 1880	235,000	Total	2,302,000

EXPENDITURES.

Total to June 30, 1893	$2,163,825.73
Total amount appropriated on present project to June 30, 1893	950,000.00
Total expenditures on present project to June 30, 1893	811,825.73

Money statement.

July 1, 1892, balance unexpended		$171,278.24
Amount appropriated by act approved July 13, 1892		50,000.00
		221,278.24
June 30, 1893, amount expended during fiscal year		83,103.97
July 1, 1893, balance unexpended		138,174.27
July 1, 1893, outstanding liabilities	$6,570.41	
July 1, 1893, amount covered by uncompleted contracts	8,280.89	
		14,851.30
July 1, 1893, balance available		123,322.97

Amount (estimated) required for completion of existing project.....$1,475,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895.. 500,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for dredging in the channel through Cherry Island Flats, Delaware River, opened September 1, 1892, by Lieut. A. M. D'Armit, Corps of Engineers.

[Approximate quantity of material to be removed, 735,000 cubic yards.]

No.	Name and address of bidder.	Price per cubic yard.	Amount.
1	Atlas Dredging Co., Wilmington, Del	0.09\frac{9}{10}$	$72,765.00
2	R. G. Bailey, Philadelphia, Pa	.13	95,550.00
3	National Dredging Co., Wilmington, Del	.11$\frac{5}{8}$	85,443.75
4	American Dredging Co., Philadelphia, Pa	.09$\frac{7}{10}$	71,295.00

Contract (dated September 6, 1892,) entered into with American Dredging Company. In progress.

COMMERCIAL STATISTICS.

The following statements concerning the foreign commerce of the Delaware River for the years ending December 31, 1891 and 1892, are compiled from the reports of the Board of Trade, the Commercial Exchange, and the Maritime Exchange of the city of Philadelphia:

Articles.	Gross tons.	
	1891.	1892.
IMPORTS.		
Glue and glue stock		10,258
Cement	32,507	48,035
Burlap		1,035
Mineral water		896
Rags	32,040	2,185
Terra alba		2,341
Clay	13,057	9,269
Wood pulp, paper, and manufactures of	5,371	28,533
Asphalt and asphalt blocks	13,858	23,583
Ice		1,407
Live stock and fowls	46	28
Sulphur ore	28,604	46,932
Chalk	30,408	24,925
Cane and other sugar	401,831	392,433
Coal tar and pitch of	1,948	2,384
Wood and manufactures of		12,764
Coal	697	5,130
Sulphur, crude		11,278
Hair and manufactures of	5,088	4,600
Plaster of Paris	14,249	18,033
Fertilizers	10,886	3,125
Hemp, jute, flax, and their fabrics	14,082	10,302
Oil		2,199
Stone and manufactures of	1,778	3,981
Ores, metals, and manufactures of	5,168	7,168
Manufactures, other	1,499	2,305
Tobacco	442	577
Tin	54,023	42,462
Glass and manufactures of	3,079	3,565
Plants and seeds	2,196	1,158
Fruits	14,528	20,126
Iron ore	406,926	446,161
Iron, manufactured	11,564	19,134
Wines and liquors	772	1,144
Silk and manufactures of	85	80
Leather and manufactures of	2,304	4,171
Cotton and cotton fabrics	730	668
Wool and wool fabrics	7,676	10,895

COMMERCIAL STATISTICS—continued.

Articles.	Gross tons.	
	1891.	1892.
IMPORTS.		
Drugs and chemicals	107, 051	94, 964
Groceries and provisions	7, 748	1, 926
Salt	15, 174	13, 180
Sugar and molasses	132, 739	93, 698
Miscellaneous	1, 717	596
Total	1, 381, 871	1, 429, 634
EXPORTS.		
Seeds	2, 042	461
Beef, pork, and products	30, 444	30, 728
Soap, tallow, and grease		6, 112
Paraffine		8, 287
Glucose	5, 261	10, 676
Oil cake	20, 934	23, 111
Oils, other	16, 934	6, 119
Lubricating oils		26, 214
Tobacco	8, 159	8, 373
Petroleum, crude and refined	655, 901	807, 447
Drugs and chemicals		5, 314
Wood, and manufactures of	22, 626	81, 063
Cars and locomotives	13, 246	8, 723
Manufactures, other	10, 484	7, 657
Molasses	5, 920	10, 754
Coal	356, 994	395, 059
Wines and liquors		121
Hides, leather, and manufactures of		1, 209
Live stock	14, 239	28, 251
Iron, and manufactures of	6, 570	5, 121
Other metals, and manufactures of	616	401
Cotton	6, 169	4, 184
Groceries and provisions	1, 414	4, 928
Corn and corn meal	69, 693	487, 216
Wheat	184, 195	267, 697
Flour	101, 180	164, 511
Oats and oatmeal	4, 838	7, 052
Miscellaneous	3, 107	2, 366
Total	1, 540, 966	2, 359, 155

Passengers arriving from foreign countries	31, 427
Passengers departing for foreign countries	4, 903
Total	36, 330

Comparative statement of gross tons and values of exports, imports, and revenue collected.

Year.	Exports.		Imports.		Revenue.
	Gross tons.	Value.	Gross tons.	Value.	
1888	780, 642	$28, 012, 879	1, 016, 909	$45, 020, 132	$20, 569, 684
1889	851, 933	31, 403, 720	1, 108, 660	50, 996, 802	22, 612, 956
1890	1, 502, 771	36, 462, 951	1, 424, 102	56, 057, 011	27, 572, 351
1891	1, 540, 966	42, 845, 724	1, 381, 871	62, 438, 219	11, 121, 320
1892	2, 359, 145	60, 274, 024	1, 429, 636	63, 277, 781	10, 886, 475

Foreign entrances and clearances.

Class.	Entered from foreign ports.				Cleared for foreign ports.				Total.	
	With cargoes.		In ballast.		With cargoes.		In ballast.			
	No.	*Tons.*	*No.*	*Tons.*	*No.*	*Tons.*	*No.*	*Tons.*	*No.*	*Tons.*
American steam vessels	44	82, 606	3	2, 217	39	79, 004	10	6, 622	96	170, 449
American sail vessels	345	180, 884	9	10, 001	283	164, 445	1	366	638	355, 696
Foreign steam vessels	700	923, 502	246	399, 528	682	1, 058, 613	136	83, 446	1, 764	2, 465, 089
Foreign sail vessels	214	120, 748	57	65, 771	264	196, 606	15	6, 623	550	389, 748
Total	1, 303	1, 307, 740	315	477, 517	1, 268	1, 498, 668	162	97, 057	3, 048	3, 380, 982

The following statements concerning the domestic and coastwise commerce of the Delaware River for the years ending December 31, 1891 and 1892, have been compiled from returns made to this office by shippers and consignees:

Articles.	1891.		1892.	
	Gross tons.	Value.	Gross tons.	Value.
ARRIVING.				
Brick and terra cotta	25,160	$86,924	23,644	$236,570
Chemicals	8,194	268,779	22,098	477,638
Coal	268,716	951,791	153,386	600,618
Cement and plaster	9,877	85,249	10,439	80,587
Cotton	6,458	1,291,600	6,894	1,301,191
Grain	26,384	732,340	144,804	3,645,935
Hay	5,564	48,179	6.486	63,589
Ice	517,608	1,015,710	607,294	1,138,915
Iron, pig	14,131	305,449	24,380	450,656
Iron, manufactured	85,206	2,980,169	52,546	1,628,730
Lumber	383,879	3,343,437	451,157	4,075,142
Oysters and fish	28,502	463,050	29,879	623,884
Produce and fruit	33,717	1,290,350	74,210	2,886,023
Phosphate rock	45,338	337,900	59,414	480,297
Fertilizers, other	15,125	185,397	31,719	85,471
Railroad ties	27,473	164,838	104,716	628,296
Sugar	9,257	1,061,420	590	34,176
Stone, building	88,523	237,753	103,575	868,650
Stone, paving	57,166	196,192	60,010	210,035
Sand	660,471	575,670	812,274	420,804
Wood, cord	21,878	67,623	33,933	107,790
Scrap iron	....	....	6,150	72,700
Oil	....	....	47,526	738,522
Miscellaneous	1,980,848	76,742,316	1,470,086	56,950,632
Total	4,325,475	92,432,136	4,337,210	77,306,851
DEPARTING.				
Brick	25,522	90,300	25,608	106,634
Chemicals	11,367	365,639	19,713	457,884
Coal	3 947,545	12,055,786	4,306,023	13,122,122
Cotton	8,060	1,612,000	1,485	288,134
Grain	6,509	204,530	7,412	188.384
Hay	8,320	90,774	5,998	62,910
Iron, pig	44,901	716,491	57,605	939,009
Iron, manufactured	97,967	3,324,446	75,272	2,395,845
Lumber	40,292	360,305	45,416	406,785
Manure	114,555	123,385	125,670	139,185
Fertilizers	42,272	953,637	60,246	1,019,606
Oysters	91,714	1,284,000	91,714	1,284,000
Petroleum and products	38.776	1;831.394	52,366	883,979
Produce	5,080	76,625	14,987	266,360
Sand	40,931	60,897	49,582	78,742
Sugar	2.258	270,960	405	48,600
Miscellaneous	1,662,810	78,804,876	1,506,800	70,819,600
Total	6,188,879	102,226,045	6,446,302	92,507,779

Passengers.

	1891.	1892.
Passengers arriving at Philadelphia	954,463	1,077,244
Passengers departing from Philadelphia	957.310	1,095,498
Total	1,911,773	2,172,742

Domestic and coastwise arrivals and departures in cargo.

Class.	1891.		1892.	
	Arrivals.	Departures.	Arrivals.	Departures.
Steamers	15,903	16,070	*14,546	*15,323
Sailing vessels	8,275	11,937	7,220	6,831
Canal boats and barges	25,263	27,917	†18,526	‡23,230
Rafts	329	179	322	160
Total	49,770	56,103	40,614	45,544

* Excluding tugboats and ferry boats.
† Including 5,537 railroad lighters between Camden and Philadelphia.
‡ Including 5,591 railroad lighters between Camden and Philadelphia.

SUMMARY.

Freight movement.

	1891.		1892.	
	Gross tons.	Value.	Gross tons.	Value.
Foreign:				
Arriving	1,381,871	$62,438,219	1,429,636	$63,277,781
Departing	1,540,966	42,845,724	2,359,145	60,274,024
Domestic:				
Arriving	4,325,475	92,432,136	4,337,210	77,306,851
Departing	6,188,879	102,226,045	6,446,302	92,507,779
Total	13,437,191	299,942,124	14,572,293	293,366,435

Vessel movement.

Steam vessels, foreign trade, arriving	993
Sailing vessels, foreign trade, arriving	625
Steam vessels, foreign trade, departing	867
Sailing vessels foreign trade, departing	563
Steam vessels, domestic trade, arriving	14,546
Sailing vessels, domestic trade, arriving	7,220
Canal boats and barges, domestic trade, arriving	18,526
Rafts, domestic trade, arriving	322
Steam vessels, domestic trade, departing	15,323
Sailing vessels, domestic trade, departing	6,831
Canal boats and barges, domestic trade, departing	23,230
Rafts, domestic trade, departing	160
Total	89,206

NOTE.—Of the above vessels there were reported 1,476 with drafts of 18 to 27 feet, and upward of 300 registered at 2,000 to 3,600 tons.

RESOLUTION OF THE BOARD OF PORT WARDENS FOR THE PORT OF PHILADELPHIA PASSED FEBRUARY 6, 1893, REQUESTING REMOVAL OF THE BAR BELOW BURLINGTON, OPPOSITE BRISTOL.

PHILADELPHIA, PA., *February 9, 1893.*

Resolved, That Maj. C. W. Raymond, Corps of Engineer, U. S. Army, in charge of the river and harbor improvements, Delaware River, be requested to take such action as may be within his authority to speedily remove the bar below Burlington Island opposite Bristol.

JOEL COOK,
President.

LETTER FROM THE CLERK OF COUNCIL OF BRISTOL BOROUGH, TRANSMITTING COPY OF RESOLUTION OF COUNCIL PASSED MARCH 13, 1893.

CORPORATION BRISTOL BOROUGH,
OFFICE OF SECRETARY,
Bristol, Pa., March 14, 1893.

DEAR SIR: At a meeting of the burgers and council of Bristol borough, held at the council chamber Monday, March 13, 1893, the following preamble and resolutions were unanimously adopted:

Whereas, the Bristol member of the board of wardens of the port of Philadelphia has informed council that the channel in the river Delaware immediately below the borough is rapidly filling, and that river traffic is greatly impeded thereby,

Resolved, That council respectfully and earnestly urges upon Maj. Raymond, U. S. Engineer Corps, that he take such steps for securing the removal of the bar between Burlingon and Bristol in order that the river trade of the borough may not be impeded.

Resolved That the clerk of council be directed to furnish Maj. Raymond with an attested copy of these resolutions.

Yours,

J. WESLEY WRIGHT,
Clerk of Council.

Maj. C. W. RAYMOND,
Corps of Engineers.

PETITION FROM BUSINESS MEN OF BRISTOL, PA.

BRISTOL, PA., *March 14, 1893.*

The undersigned, business men of Bristol, Pa., respectfully ask that measures be taken for the removal of the bar in the Delaware River, between Burlington, N. J., and Bristol, Pa., which is extending so rapidly as to threaten the closing of navigation at that point.

We would respectfully represent that the said bar was formed by the dumping of sand ballast at that point of Burlington Island about forty years ago by coal-carrying vessels trading between Bristol, Pa., and points in the Eastern and Southern States, and the it has been added to by accretions of the alluvial matter held in suspension by the river until it has become a serious obstacle to the steamers and other vessels trading between Philadelphia and New York, via the Delaware River and the Delaware and Raritan Canal.

Chas. E. Scott, L. A. Hoguet, James Wright, Wm. S. Silbert, Harry H. Headley, Edwin J. Burton, John Harshaw, James Drury, Howard Russell, William H. H. White, E. W. Groom, S. W. Black, Geo. W. Strauser, John T. Thorne, William H. Booz, C. J. Patton, S. W. Groff, John C. Stuckert, Frank P. Horn, John W. Wilkinson, Hugh F. Kelly, Jesse O. Thomas, J. Wesley Wright, Charles J. Wright, A. Weir Grimeson, John McOwen, Frank F. Bell, William Souderbough, C. S. Vandergrift, John C. Brown, Benj'n J. Taylor, Geo. P. Renouf, Pierson Mitchell, Budd D. Fine, Anthony Swain, W. Harry Vanhorn, John Burton, J. Leavitt Fine, Elwood Burton, Wm. S. Daniels, Wm. H. Grundy & Co., W. Q. Bunting, G. A. Shoemaker, Wm. Jermeson, Joseph Vansant, Henry Bach, Charles R. Thompson, Owen Evans, E. B. Rose, J. Merton Randall, William B. Jones, Wm. M. Dunning, jr., D. Landreth & Sons, Thos. B. Douglass, R. B. Kelly, Robert W. Holt, T. B. Harkins Foundry Co., Thomas Gosline, Thos. L. Leedom & Co., A. E. Baylies, B. C. Foster, L. C. Wettling, Charles Saxton, S. B. Hibbs, John Dorrance, Hosea Hibbs, S. W. Hayes, George Callanan, E. T. Faber, Fred Scott & Co., G. H. Adams, W. Blackwood, Wilson & Fenimore Co., Wm. P. Wright, Wm. E. Doron, Edwd. Thomas, H. B. Beatty, Benj. T. Lovett, Thomas Scott, William Young, Samuel Scott.

Maj. C. W. RAYMOND,
Corps of Engineers.

PETITION FROM OWNERS OF STEAMBOATS NAVIGATING THE DELAWARE RIVER ABOV PHILADELPHIA.

PHILADELPHIA, PA., *June 21, 1893.*

SIR: The undersigned being the owners of the steamboats that travel up the Delaware River above Philadelphia, and being largely interested in the shipping business in that locality, do respectfully request that you take measures to remove th bar which has been formed at a point in the channel of the Delaware River opposit the lower end of Burlington Island. This bar is an artificial formation, having bee formed within the past fifteen years. Its growth has been very rapid within th past eight years, and if it continues at the same rate the channel will be completel shut off. The channel of the upper Delaware, in addition to being used for shippin purposes by the local towns located upon it, is also a means of communication wit New York by way of the river and the Delaware and Raritan Canal. The closin of this channel would end all inland water communication between Philadelphi Trenton, and New York.

Respectfully,

The Upper Delaware River Transportation Company, by Henry V. Massey vice-president; F. S. Grove, Baltimore and Philadelphia Steamboa Company; S. and J. M. Flanagan; George F. Tyler, manager, Interstate Steamboat Company; W. E. Bernard, agent, Transportation Line Chas. L. Flanagan, manager, steamer *Edwin Forrest*; J. E. Vankirk superintendent, Clyde Steamship Company.

G 2.

IMPROVEMENT OF HARBOR BETWEEN PHILADELPHIA, PA., AND CAMDEN, N. J.

The original project for this improvement is contained in the repor of a board of engineers, dated March 30, 1888, and published in th Annual Report of the Chief of Engineers for 1888. It provides for th removal of Windmill and Smith islands and the adjacent shoals so a to form a 26-foot channel about 1,000 feet wide, or wider if found practicable during the progress of the work, along the front of the revise Philadelphia wharf line, from Kaighn Point to the foot of Petty Island It is further proposed to widen the Pennsylvania channel at Petty Island so as to give it a width of about 2,000 feet, a depth of 26 fee over a width of about 1,000 feet, more or less, the channel sloping to depth of 12 feet in the remaining width, and a resulting cross sectio at half tide of about 55,000 square feet. The quantity of material t be removed was about 18,000,000 cubic yards, place measurement. Th cost of the dredging required to carry out this project was estimate at $3,500,000.

This project further provides for the simultaneous regulation of th port wardens' lines of both shores of the river so as to maintain th assigned section of the new channel and the establishment of thes lines by actual constructions during the progress of the work. Th reconstruction of the water fronts to conform to the new lines will b executed at the expense of the cities of Philadelphia and Camden o the riparian owners. The cost of this reconstruction for a portion o the Philadelphia front from opposite Kaighn Point to opposite the lowe end of Petty Island, exclusive of the cost of property for widenin Delaware avenue, has been estimated at about $8,000,000.

The sundry civil act approved March 3, 1891, contained the followin provisions with reference to this work:

Provided, That the plan for the improvement may be modified by changing th line limiting the excavation on Petty Island to such position as the Secretary o

> War may consider desirable, and the material to be removed from said islands and shoals under this appropriation, and appropriations heretofore made, shall be deposited and spread on League Island, and to the extent of the cost of such deposit and spreading the said appropriations are hereby made available: *Provided, further*, That the title to any additional lands acquired for this purpose shall be vested in the United States without charge to the latter.

By this legislation the original project was modified by providing for the deposit and spreading of material on League Island, a work the cost of which was not included in the original estimates, and by increasing the amount of excavation along the northern shore of Petty Island. At the price established in the existing contract the filling at League Island is estimated to cost from $320,000 to $1,200,000, according to the amount of filling required. The quantity of material to be removed under the modified project is about 21,500,000 cubic yards as measured in scows, and the cost of the dredging is estimated at $3,053,000.

The provision in the act above referred to, requiring the material removed to be deposited and spread on League Island, was temporarily the cause of delay in the progress of the work, since it made the rate of excavation dependent upon the quantity of material which could be handled at League Island; and had it remained in force it would have prevented the development of the shores in accordance with the adopted plan of improvement. This difficulty was entirely removed by the following provision in the river and harbor act approved July 13, 1892:

> The material removed in improving the harbor of Philadelphia, Pennsylvania and New Jersey, in accordance with the plan adopted by Congress in the act of September 19, 1890, under appropriations heretofore made, or any part of said material, may be deposited in any place or places approved by the engineer officer in charge of the work: *Provided*, That the full amount of material to be deposited and spread on League Island, as provided for under the existing contract, shall be so deposited and spread before the completion of the work covered by the contract; and all acts or parts of acts inconsistent or in conflict with this provision are hereby repealed.

Under the provisions of the sundry civil act of March 3, 1891, the line limiting the excavation on Petty Island, staked out in March, 1891, by authority of the Secretary of War, dated March 7, 1891, was definitely established, title to the additional lands acquired for the purpose having been vested in the United States without charge to the latter.

The amount expended upon this project to June 30, 1892, was $64,208.56. At that date title to the necessary lands had been vested in the United States; harbor lines conforming to the new conditions had been established by the War Department; necessary hydrographic surveys had been made; about 357,429 cubic yards of material, scow measurement, had been removed by dredging and scour; 2,330 feet of revetment had been wholly removed, and 923 feet had been removed to low water; and 287,736 cubic yards of material, scow measurement, had been deposited on League Island.

During the past fiscal year, work was in progress under a contract with James A. Mundy & Co., of Philadelphia, dated April 23, 1891, until December 23, 1892. As stated in the last Annual Report, the time fixed for the removal of Windmill Island and the adjacent shoal to the level of 12 feet below mean low water was, at the request of the contractors, extended to July 31, 1892, with the understanding that if the amount of work anticipated by them was executed during the month of July, an application for further extension would receive favorable consideration. Upon the application of the contractors, a further extension was granted, on August 2, 1892, until January 1, 1893. On December 9, 1892, the contractors applied for a further extension of time to April 1, 1893, for the execution of the work specified. This extension was not granted; and on December 23, 1892, in accordance with the directions of the Secretary of War, and under the instructions of the Chief of Engineers, dated December 22, 1892, the contract was annulled "because of failure to prosecute the work faithfully and diligently in accordance with the specifications and requirements of the contract."

The work done during the past fiscal year under the contract with James A. Mundy & Co., was as follows: 5,495 linear feet of revetment were removed; 483,283 cubic yards of material, scow measurement, were dredged from Windmill Island and the adjacent shoal, and 327,228 cubic yards of material, scow measurement, were deposited on League Island.

Under date of June 1, 1893, a contract was entered into with the American Dredging Company of Philadelphia, Pa., for all the work required for the improvement. The contract provides for the commencement of the work on or before July 1, 1893. Under this contract and at the close of the past fiscal year 112,825 cubic yards of material, scow measurement, had been excavated.

The total amount of work accomplished to June 30, 1893, is as follows:

Material removed by dredging, scow measurement	cubic yards..	918,537
Piling and revetment removed	linear feet..	7,825

At the close of the fiscal year ending June 30, 1892, about 35,000 cubic yards of material had been removed by scour. Since that time scouring appears to have been continuously in progress, but the amount thus removed can not be satisfactorily determined until further extension of the surveys.

During the fiscal year ending June 30, 1894, it is confidently expected that all the revetment will be removed, that at least 3,000,000 cubic yards, scow measurement, will be excavated and deposited; and that at least 700,000 cubic yards, place measurement, will be deposited and spread on League Island.

Under date of December 12, 1892, the Secretary of War authorized the construction and extension of piers between the bulkhead and pierhead lines along the Philadelphia water-front between Moore street and Queen street, subject to the regulations recommended in my letter to the Department, dated November 26, 1892, a copy of which is appended hereto.

The State of Pennsylvania and the city of Philadelphia have enacted laws and ordinances to facilitate the reconstruction of the Philadelphia water-front, in accordance with the adopted project for the improvement of the harbor. Detailed information with reference to this action is given in a letter dated June 30, 1893, from Mr. W. R. Tucker, secretary of the board of harbor commissioners, which he has kindly prepared at my request. This letter and its accompanying papers are appended hereto.

One wharf and about 650 feet of bulkhead have been advanced to the new lines on the Camden water-front, and other constructions on both sides of the harbor are expected in the near future.

I desire to express my sincere thanks to the Philadelphia board of harbor commissioners and to the joint executive committee for the improvement of the harbor, representing the principal commercial and maritime organizations of the city, for their earnest and intelligent assistance and support.

The commercial statistics pertaining to this work are included in the statistics accompanying the report for improvement of Delaware River.

This work lies in the collection district of Philadelphia, at which as a port of entry there was collected during the year ending December 31, 1892, revenue to the amount of $10,886,475.42.

The nearest fort and light-houses are, respectively, Fort Mifflin and Schuylkill River range lights.

APPROPRIATIONS.

Act of—	
August 11, 1888	$500,000
September 19, 1890	200,000
March 3, 1891	300,000
August 5, 1892	41,000
March 3, 1893	500,000
Total	1,541,000

EXPENDITURES.

Total to June 30, 1893	$460,534.52
Total appropriations under present project to June 30, 1893	1,241,000
Total expenditures under present project to June 30, 1893, including the sum of $55,428.11 paid for depositing and spreading material on League Island	160,534.52

Money statement.

July 1, 1892, balance unexpended		$635,791.44
Amount appropriated by sundry civil act approved August 5, 1892		41,000.00
Amount appropriated by sundry civil act approved March 3, 1893		500,000.00
		1,176,791.44
June 30, 1893, amount expended during fiscal year		96,325.96
July 1, 1893, balance unexpended		1,080,465.48
July 1, 1893, outstanding liabilities	$16,071.15	
July 1, 1893, amount covered by uncompleted contracts	1,064,394.33	
		1,080,465.48
Amount (estimated) required for completion of existing project		2,259,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895		250,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.		

Abstract of proposals for dredging and removal of wharfing in the improvement of the harbor of Philadelphia opened January 31, 1893, by Maj. C. W. Raymond, Corps of Engineers.

No.	Name and address of bidder.	Price per cubic yard for excavating and depositing material at places approved by the engineer officer in charge (21,500,000 cubic yards, approximate).	Price per linear foot for removing pile and timber wharfing or revetment (16,200 linear feet, approximate).	Additional price per cubic yard for depositing and spreading material upon League Island (2,000,000 cubic yards, approximate).	Amount.
1	Michael J. Coffey, Brooklyn, N. Y., Nicholas Connolly, Quebec, Canada, and Michael Connolly, Kingston, Ontario	$0.12½	$1.25	$0.14	$2,987,750.00
2	American Dredging Co., Philadelphia, Pa	.14$\frac{2}{10}$	1.90	.16	3,403,780.00
3	The Penn Dredging Co., Philadelphia, Pa	.14$\frac{7}{10}$	1.90	.17½	3,541,280.00

Cost of work as estimated by the Board of Engineers of 1888, not including the depositing of material on League Island, and the additional excavation on Petty Island authorized by the sundry civil act of March 3, 1891, $3,500,000.

Contract (dated June 1, 1893) entered into with American Dredging Company. In progress.

LETTER OF MAJOR C. W. RAYMOND, CORPS OF ENGINEERS, RECOMMENDING THAT THE CONSTRUCTION AND EXTENSION OF PIERS BETWEEN BULKHEAD AND PIER-HEAD LINES ALONG THE PHILADELPHIA WATER FRONT BE AUTHORIZED; AND SUBMITTING REGULATIONS TO GOVERN THE CONSTRUCTION OF PIERS.

UNITED STATES ENGINEER OFFICE,
Philadelphia, Pa., November 26, 1892.

GENERAL: Harbor lines for a portion of the port of Philadelphia, consisting of pier-head and bulkhead lines, and extending along the Philadelphia water front from Moore street to Otis street, were established by the Secretary of War on January 20, 1891, under the provisions of the river and harbor act of September 19, 1890. The harbor line board, in its report dated January 2, 1891, remarked as follows:

"These lines are located so as to conform to the conditions which will exist when the islands and shoals have been removed and the improvement of the harbor has been completed. The advance of wharves to them at the present time would obstruct the existing navigable channel and be followed by other injurious results, yet it is desirable that such advance should be not only permitted but encouraged at proper times and places during the progress of the work."

Accordingly, these lines were established "subject to the condition that wharves shall only be extended beyond the present legal port warden's lines at such times and places as may be approved by the Secretary of War."

Heretofore it has not been considered desirable to permit the advance of any piers on the Philadelphia water front, as the amount of scour during the progress of the excavation of Windmill Island has been very large, especially on the side towards Philadelphia. A survey just completed shows that slight shoaling is now going on below the southern limit of the 12-foot contour. It is, therefore, now desirable to encourage the advance of piers between Moore and Queen streets.

If piers are now advanced, under proper conditions, between these limits, it is believed that they will greatly assist the work of improvement by increasing the scour upon the shoal, and they will not seriously obstruct the existing navigable channel.

It is understood that, under the provisions of section 12 of the act of September 19, 1890, the Secretary of War may prescribe regulations to govern the construction of all structures between the bulkhead and pier-head lines, should such regulations be considered essential to the preservation and protection of the harbor.

After a careful study of the changes which have taken place along the Philadelphia water front since 1819, I am of the opinion that in order to establish and maintain a regular channel, it is necessary to prescribe the following regulations to govern the construction of piers.

1. All piers hereafter constructed or extended must extend to the pier-head line.
2. No cribs or other solid structure shall be hereafter constructed between the bulkhead and pier-head lines below a level 2 feet above mean high water.
3. In the construction of new piers or the extension of old ones, the pile groups supporting the superstructure shall be at least 10 feet apart.

I have the honor to recommend that the construction and extension of piers between the bulkhead and pier-head lines along the Philadelphia water front between Moore street and Queen street be now authorized subject to the above regulations, and that all structures hereafter erected within those limits which are not in accordance with said regulations be considered in violation of section 12 of the act of September 19, 1890.

Very respectfully, your obedient servant,

C. W. RAYMOND,
Major, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. H. L. Abbot, Corps of Engineers, Division Engineer, Northeast Division.)

LETTER FROM MR. W. R. TUCKER, SECRETARY OF THE BOARD OF HARBOR COMMISSIONERS FOR THE CITY OF PHILADELPHIA, PA., WITH REFERENCE TO WHAT HAS BEEN ACCOMPLISHED IN THE WAY OF LEGISLATION IN AID OF THE PROPOSED RECONSTRUCTION OF THE WATER FRONT ON THE DELAWARE RIVER; WITH 5 INCLOSURES.

BOARD OF HARBOR COMMISSIONERS FOR THE
CITY OF PHILADELPHIA.
Philadelphia, Pa., June 30, 1893.

SIR: I beg to acknowledge the receipt of your communication under date of May 31, which reached me in due course, in which you ask to be furnished with a concise statement of what has been accomplished through the recommendations of the board of harbor commissioners in the way of legislation by the State legislature and city councils in aid of the proposed reconstruction of the water front on the Delaware River.

In asking for the information you limit your inquiry to acts of assembly and ordinances of city councils which have been passed since June 30, 1892. I take the liberty, however, of going back of the date mentioned, in order that the action of city councils in authorizing the establishment of the harbor lines under the authority of the act of assembly approved June 8, 1891 (p. L. 209), shall be officially brought to the attention of the Chief of Engineers.

On September 15, 1891, the committee on surveys of city council agreed unanimously upon a form of ordinance authorizing the board of harbor commissioners to file in the department of public works (bureau of surveys) "the line beyond which no wharf or pier shall extend, and the arbitrary low-water line or bulkhead line in front of the city of Philadelphia" which shall be established "in conformity with the plan or plans of said lines adopted by the Secretary of War from time to time," and providing further that "from and after said filing said line or lines shall be established in accordance with the plan or plans so officially filed." Copy of the report of the council's committee, with form of ordinance, is inclosed herewith and marked A. The report of the committee was accepted by councils and the ordinance adopted. It received the approval of the mayor October 7, 1891.

The harbor commissioners, under date of December 31, 1892, submitted to city councils a report stating that, under the authority of an ordinance of councils, they had filed with the department of public works (bureau of surveys) the new bulkhead line, extending from Moore street to Otis street, and the new pier-head line, beyond which no pier could be extended between Moore street and Queen street. This report also contained a suggested plan for the rearrangement of the piers and docks northward from Moore street to Queen street, and recited the restrictions placed by the Secretary of War on the character of the wharf construction in that section. The commission submitted a form of an act of assembly giving to city councils the power to condemn and take such wharf property as may be needful in carrying out any plan for the reconstruction of the harbor; and it also presented a copy of an ordinance providing for the manner of building wharves between Moore and Queen streets. A copy of this report, marked B, is forwarded with this.

On January 18, 1893, the committee on commerce and navigation of city councils considered this report and the recommendations of the harbor commissioners met with its approval. The committee likewise approved the draft of the proposed act of assembly submitted by the harbor commissioners to "authorize the condemnation of wharves, piers, bulkheads, and riparian rights, and to prescribe their plan of construction," and reported to city councils a resolution requesting the general assembly of the Commonwealth of Pennsylvania to pass the act. The action of the committee met with the approval of the councils and the resolution of request was transmitted to the State legislature. A copy of the report of the committee with resolution is inclosed herewith, marked C.

The draft of the act, as proposed by the harbor commissioners and adopted by city councils, did not meet with the approval of the large wharf owners here, and it was materially amended during its consideration in the senate and house. The bill, however, finally passed during the closing hours of the legislature and received the signature of the governor on the 3d instant. A copy of the act as signed is herewith handed you and marked D.

The ordinance, as submitted in the report of the harbor commissioners, regulating wharf construction in the portion of the river front between Moore street and Queen street conforming to the regulations prescribed by the Secretary of War under provisions of section 12 of the act of Congress of September 19, 1890, passed city councils without amendment and was approved by the mayor March 22, 1893.

The board of harbor commissioners in its report recommended that the city should "establish Delaware avenue as a highway, about 150 feet wide between Moore street and Otis street, to be placed upon the city plan and opened and constructed from time to time as the progress of the harbor improvement may permit." In following out the recommendations of the board, city councils have passed "An ordinance to authorize the revision of lines and grades of Delaware avenue from Christian street to the angle in said Delaware avenue northeast of Laurel street, and to make the width thereof not less than 150 feet." A copy of the ordinance is inclosed, marked E.

The committee of councils, in considering the widening of Delaware avenue south of Christian street, concluded to postpone action thereon in view of the request of interested property owners in that portion of the city who desire that a thorough study be made of the street lines and grades adjacent to the Delaware River, with a view of locating Delaware avenue farther westward, so as to admit of the construction of longer docks and permit large tracts of unimproved property to be laid out for manufacturing and maritime interests, including some proposed large ship-building establishments.

While Delaware avenue has been on the city plans north from the Aramingo Canal for a number of years, yet it has never been opened, owing to the great inconvenience and damage that such an opening would have entailed upon the manufacturing and ship-building establishments along the Delaware River in that vicinity. City councils, therefore, through the petition of the William Cramp & Sons' Ship and Engine Building Company, indorsed by other large manufacturing interests on the line of the avenue, passed an ordinance providing for the revision of a number of streets in that neighborhood, and for the vacation and striking from the city plans of Delaware avenue from Aramingo Canal to Cumberland street.

The work of the board of harbor commissioners in securing legislation from the State legislature and the municipal government has been most ably seconded by the earnest and active coöperation of the joint executive committee on the improvement of the harbor, composed of representatives from the board of trade, commercial exchange, maritime exchange, drug exchange, grocers and importers' exchange, vessel owners and captains' association, board of port wardens, and the manufacturers' club. You are doubtless aware that the greatest harmony has always existed between the joint committee and the harbor commissioners, and the influence of such an intelligent and active body has greatly lightened the work of the commissioners.

I can not close without congratulating you, on behalf of the board of harbor commissioners, upon the termination of the controversy over the reletting of the contract for the improvement of the harbor, and to express for the board and those deeply interested in the work their appreciation of the wise and business-like solution of the difficulty.

I remain, sir, your obedient servant,

W. R. TUCKER,
Secretary.

Maj. C. W. RAYMOND,
Corps of Engineers.

INCLOSURE A.—APPENDIX NO. 219.

PHILADELPHIA, *September 15, 1891.*

To the Select and Common Councils of the City of Philadelphia:

GENTLEMEN: We, your committee on surveys, to whom was referred the accompanying ordinance to fix the wharf line and low-water line on the Delaware front of the city, beg leave to report that they have considered this ordinance to fix the wharf line and low-water line on the Delaware front of the city so as to make the same agree with that adopted by the board of harbor commissioners, and approved by the United States War Department, and have approved, and do return the same with a favorable recommendation.

Thomas L. Hicks (chairman), John O. Taxis, Fred C. Simon, W. H. James, J. Emory Byram, Wm. P. Becker, Isaac D. Hetzell, Thos. Wagner, jr., P. A. McClain, L. W. Moore, Frank Schanz, John Morrison, D. C. Cleaver.

AN ORDINANCE establishing the revised line beyond which no wharf or pier shall extend, and the arbitrary low-water line or bulkhead line on the Delaware River, in front of the city of Philadelphia.

SECTION 1. The select and common councils of the city of Philadelphia do ordain that, in accordance with the authority of an act of assembly of the Commonwealth of Pennsylvania, approved June 8, 1891 (P. L. 209), the line beyond which no wharf or pier shall extend, and the arbitrary low-water line or bulkhead line in front of the city of Philadelphia, shall be established in conformity with the plan or plans of said lines adopted by the Secretary of War from time to time, and filed by the board of harbor commissioners for the city of Philadelphia in the department of public works (bureau of surveys).

SEC. 2. That whenever the said board of harbor commissioners shall officially file said plan or plans in the department of public works (bureau of surveys), fixing the line beyond which no wharf or pier shall extend, and the arbitrary low-water line or bulkhead line on the Delaware River in front of the city of Philadelphia, then from and after said filing said line or lines shall be established in accordance with the plan or plans so officially filed.

INCLOSURE B.

BOARD OF HARBOR COMMISSIONERS FOR THE CITY OF PHILADELPHIA,
Philadelphia, December 31, 1892.

To the President and Members of the Select and Common Councils of the city of Philadelphia:

The board of harbor commissioners for the city of Philadelphia has the honor to submit the following report:

In accordance with the provisions of the act of assembly approved June 8, 1891, and the ordinance of city councils approved October 7, 1891, this board has transmitted to the department of public works (bureau of surveys) the plan of the new harbor lines for the harbor of Philadelphia, fixed by the Secretary of War, embracing the new bulkhead line from Moore street and the new line between Moore street and Queen street, beyond which no wharf or pier shall extend. The construction of new piers to the advanced pier-head line is now permissible by proper authority in the district between Moore street and Queen street under certain regulations prescribed by the Secretary of War to govern wharf construction on that part of the river front.

This opening of a portion of the harbor front for new wharf construction, as the progress of the removal of the river islands advances, makes it desirable for the city councils of Philadelphia to take into serious consideration the subject of the general improvements of the Delaware front that should follow. The board herewith transmits a plan showing the new bulkhead line between Moore street and Otis street, and the new pier-head line established northward from Moore street to Queen street. The board regards it as extremely important that the city should now establish Delaware avenue as a highway about 150 feet wide between Moore street and Otis street, to be placed upon the city plan and opened and constructed from time to time as the progress of the harbor improvement may permit. For the maintenance of this street, which is a necessity for the best commercial and maritime uses of the harbor and wharves, the city should build a suitable bulkhead wall along the bulkhead line as the new street may be opened and constructed. The cost of the street and the new bulkhead wall, this board believes, would be a proper contribution by the municipality to the general improvement of the Delaware front, as the riparian owners on their part will contribute by the construction of new wharves and docks, and the General Government by the improvement of the channel.

The plan transmitted also gives a suggested readjustment of the piers and docks in the district now open for wharf building between Moore street and Queen street, which in the opinion of the board is well adapted to the character of commerce to be accommodated on that portion of the river front. In order to equip the city councils with the proper authority for the removal of existing piers that are not adapted to the necessities of modern commerce, and also to build piers that are required to be extended to the pier-head line for the purpose of maintaining the river channel (but whose owners may decline to extend them), the board respectfully submits the subjoined act of assembly, giving the city councils authority for these purposes, which it is suggested should be enacted at the approaching session of the legislature. The fact seems to be generally conceded that the city has the right, for the purpose of widening Delaware avenue, to condemn and take the necessary land under existing statutes; but, if in the opinion of your honorable bodies there should be doubt on the subject, that matter should also be included in the necessary legislation to be asked for.

The consolidation act of February 2, 1854, provides that "the city councils shall authorize the construction of wharves upon a plan and scale to meet the demands of commerce," and the board therefore submits the subjoined form of a city ordinance regulating wharf construction in the portion of the river front now opened between Moore street and Queen street, which conforms to the regulations prescribed by the Secretary of War under the provisions of section 12 of the act of Congress of September 19, 1890. The following are the regulations:

1. All piers hereafter constructed or extended must extend to the pier-head line.
2. No cribs or other solid structures shall be hereafter constructed between the bulkhead and pier-head lines below a level 2 feet above mean high water.
3. In the construction of new piers, or the extension of old ones, the pile groups supporting the superstructure shall be at least 10 feet apart.

For the portion of the river front north of Queen street the board does not at present submit any specific plan for the readjustment of the wharves and docks, because it is of the opinion that detailed plans for reconstruction can be more intelligently devised after the islands and shoals have been further excavated, so that the action of the river currents will be more fully developed, and because the War Department has not yet authorized the advance of wharves in that section. The be hereafter constructed between the bulkhead and pierhead lines below a level feet above mean high water; that in the construction of new wharves and the e tension of old ones, the pile groups supporting the superstructure shall be at lea 10 feet apart; and that all bulkheads shall be constructed of stone or concrete m sonry above the level of 1 foot above mean low water, the plan of construction be such as to insure stability.

INCLOSURE C.—APPENDIX NO. 132.

To the president and members of the select and common councils of the city of Phil delphia:

PHILADELPHIA, *January 18, 1891.*

GENTLEMEN: Your committee on commerce and navigation to which was referr the report of the board of harbor commissioners, in which that body makes certai recommendations relative to the improvement of the harbor and river front, ha considered the same. The recommendations made by said commissioners your co mittee approved. They likewise approve of the draft of an act supplemental to a act empowering councils in cities of the first class to revise and establish wha lines and piers, etc., and ask councils to favorably consider the passage of the res lution annexed, entitled "Resolution requesting the general assembly of the Co monwealth of Pennsylvania to pass an act entitled a supplement to 'an act empo ering councils in cities of the first class to revise and establish the line for wharv and piers and low-water mark or bulkhead lines on the Delaware river in front cities of the first class,' approved June 8, 1891, to further authorize the condemn tion of wharves, piers, bulkheads and riparian rights, and to prescribe their pl of construction."

Wilbur F. Short, Frank Schanz, William G. Rutherford, R. R. Bringhurs
P. A. McClain, Thomas J. Ryan, Chas. Kitchenman, Thos. Hunter,
D., Samuel L. King, Michael J. Fahy, Robert Markmann, Alex.
Whittingham, W. E. Lindsley.

RESOLUTION requesting the general assembly of the Commonwealth of Pennsylvania to pass an entitled a supplement to an "An act empowering councils in cities of the first class to revise a establish the line for wharves and piers and low-water mark or bulkhead lines on the Delawa River, in front of cities of the first-class," approved June 8, 1891, to further authorize the conde nation of wharves, piers, bulkheads, and riparian rights, and to prescribe their plan of constr tion.

Resolved by the select and common councils of the city of Philadelphia, That the ge eral assembly of the Commonwealth of Pennsylvania be, and is hereby respectful requested to pass the accompanying act, entitled "A supplement to 'an act empo ering councils in cities of the first class to revise and establish the line for wharv and piers and low-water mark or bulkhead lines on the Delaware River, in front cities of the first class,' approved June 8, 1891, to further authorize the condemn tion of wharves, piers, bulkheads, and riparian rights, and to prescribe their pl of construction."

(NOTE.—The act submitted with this report was the same as presented in t report of the harbor commissioners and will be found therein.)

INCLOSURE D.

A SUPPLEMENT to "An act empowering councils in cities of the first class to revise and establ the line for wharves and piers and low-water mark or bulkhead lines on the Delaware River in fr of cities of the first class," approved June 8, 1891; and to further authorize the acquisition by s cities of wharves, piers, bulkheads, and riparian rights, and to prescribe and carry out the plans the construction of said wharves, piers, and bulkheads.

SECTION 1. *Be it enacted by the senate and house of representatives of the Comm wealth of Pennsylvania in general assembly met, and it is hereby enacted by the author of the same,* That it shall and may be lawful for cities of the first class to purcha and hold, in fee simple, any and all properties and improvements extending into t navigable streams in front of said cities, and the rights and privileges appertaini thereto, and to totally remove, alter, or modify the location, dimensions, or charact of construction of the same, in conformity with the plans and lines established by t Secretary of War, under the authority of Congress, in order to improve and furt

UNITED STATES ENGINEER OFFICE.
Philadelphia, Pa., December 21, 1892.

SIR: I have the honor to inform you that the Secretary of War, under date of December 12, 1892, authorized the construction and extension of piers between the bulkhead and pier headlines along the Philadelphia water front between Moore street and Queen street, subject to the following regulations, which are prescribed under the provisions of section 12 of the act of September 19, 1890.

1. All piers hereafter constructed or extended must extend to the pier headline.
2. No cribs or other solid structure shall be hereafter constructed between the bulkhead and pier headlines below a level 2 feet above mean high water.
3. In the construction of new piers or the extension of old ones, the pile groups supporting the superstructure shall be at least 10 feet apart.

All structures hereafter erected between the bulkhead and pier headlines, between Moore street and Queen street, which are not in accordance with these regulations, will be considered in violation of section 12 of the act of September 19, 1890.

A plan showing the bulkhead line from Moore street to Otis street, as established by the Secretary of War on January 20, 1891, and the portion of the pier headline between Moore street and Queen street, established on the same date, within which constructions were conditionally authorized by the Secretary of War on December 12, 1892, and written description of the same, are transmitted herewith.

I respectfully recommend that the board of harbor commissioners now officially file this plan, with the accompanying descriptions and conditions, in the bureau of surveys, department of public works, in accordance with the provisions of section 2 of an ordinance of city councils establishing the revised line beyond which no wharf or pier shall extend, and the arbitrary low-water line or bulkhead line on the Delaware River, in front of the city of Philadelphia, approved October 7, 1891.

Very respectfully, your obedient servant,

C. W. RAYMOND,
Major, Corps of Engineers.

MR. CHARLES PLATT,
President Board of Harbor Commissioners for the city of Philadelphia, Pa.

A SUPPLEMENT to "an act empowering councils in cities of the first class to revise and establish the line for wharves and piers and low-water mark or bulkhead lines on the Delaware River in front of cities of the first class," approved June 8, 1891, to further authorize the condemnation of wharves, piers, bulkheads, and riparian rights and to prescribe their plan of construction.

1. *Be it enacted,* That if in the judgment of the councils in cities of the first class it shall be necessary for the construction of wharves upon the plan and scale required to meet the demands of commerce, and to secure the improvement of the harbor of said cities in conformity with plans and lines established by the Secretary of War under the authority of the Congress and approved also by ordinance, councils shall have the full power to take and appropriate any existing pier, wharf, bulkhead, or riparian right existing under any law of this Commonwealth, the fee thereof to be vested in said city free of all incumbrances and estates. The owner of property taken shall receive compensation in the mode provided for ascertaining damages in said cities by reason of the change of grade.

2. Said councils are hereby vested with full power to prescribe by ordnance a plan of construction of wharves from the bulkhead line to the line, beyond which no wharf or pier shall extend as may secure stability, and all licenses issued for the construction of any structure in said river shall be subject to said ordinance.

3. Said councils are authorized, in order to attain the results of this act, to advance money to riparian owners to aid in the construction of wharves in accordance with the harbor lines and the plan of construction herein authorized upon such terms and conditions as may be ordained. The amount of said advance to be a lien on said structure, and to bear interest until paid.

AN ORDINANCE to authorize and regulate the construction and extension of wharves and bulkheads along the water front of the city of Philadelphia, between Moore street and Queen street.

The select and common councils of the city of Philadelphia do ordain, That the line beyond which no wharf or pier shall extend, and the arbitrary low-water line or bulkhead line in front of the city of Philadelphia, having been established between Moore street and Queen street in accordance with an ordinance of the councils of the city of Philadelphia, approved October 7, 1891, the board of port wardens is hereby authorized and instructed to grant permits for the construction and extension of wharves and bulkheads between Moore street and Queen street, in conformity with the new harbor lines thus established: *Provided,* That all wharves hereafter constructed or extended shall extend to the pierhead line, and all new wharves shall be commenced at the new bulkhead line; that no cribs or other solid structures shall be hereafter constructed between the bulkhead and pierhead lines below a level feet above mean high water; that in the construction of new wharves and the extension of old ones, the pile groups supporting the superstructure shall be at leas 10 feet apart; and that all bulkheads shall be constructed of stone or concrete masonry above the level of 1 foot above mean low water, **the plan of construction t be such as to insure stability.**

Inclosure C.—Appendix No. 132.

To the president and members of the select and common councils of the city of Philadelphia:

PHILADELPHIA, *January 18, 1891.*

GENTLEMEN: Your committee on commerce and navigation to which was referre the report of the board of harbor commissioners, in which that body makes certai recommendations relative to the improvement of the harbor and river front, hav considered the same. The recommendations made by said commissioners your committee approved. They likewise approve of the draft of an act supplemental to a act empowering councils in cities of the first class to revise and establish whar lines and piers, etc., and ask councils to favorably consider the passage of the resolution annexed, entitled "Resolution requesting the general assembly of the Commonwealth of Pennsylvania to pass an act entitled a supplement to 'an act empowering councils in cities of the first class to revise and establish the line for wharve and piers and low-water mark or bulkhead lines on the Delaware river in front o cities of the first class,' approved June 8, 1891, to further authorize the condemnation of wharves, piers, bulkheads and riparian rights, and to prescribe their pla of construction."

Wilbur F. Short, Frank Schanz, William G. Rutherford, R. R. Bringhurst
P. A. McClain, Thomas J. Ryan, Chas. Kitchenman, Thos. Hunter, M
D., Samuel L. King, Michael J. Fahy, Robert Markmann, Alex. J
Whittingham, W. E. Lindsley.

RESOLUTION requesting the general assembly of the Commonwealth of Pennsylvania to pass an a entitled a supplement to an "An act empowering councils in cities of the first class to revise an establish the line for wharves and piers and low-water mark or bulkhead lines on the Delawa River, in front of cities of the first-class," approved June 8, 1891, to further authorize the condemnation of wharves, piers, bulkheads, and riparian rights, and to prescribe their plan of constru tion.

Resolved by the select and common councils of the city of Philadelphia, That the general assembly of the Commonwealth of Pennsylvania be, and is hereby respectfull requested to pass the accompanying act, entitled "A supplement to 'an act empowering councils in cities of the first class to revise and establish the line for wharve and piers and low-water mark or bulkhead lines on the Delaware River, in front cities of the first class,' approved June 8, 1891, to further authorize the condemnation of wharves, piers, bulkheads, and riparian rights, and to prescribe their pla of construction."

(NOTE.—The act submitted with this report was the same as presented in th report of the harbor commissioners and will be found therein.)

Inclosure D.

A SUPPLEMENT to "An act empowering councils in cities of the first class to revise and establi the line for wharves and piers and low-water mark or bulkhead lines on the Delaware River in fro of cities of the first class," approved June 8, 1891; and to further authorize the acquisition by sa cities of wharves, piers, bulkheads, and riparian rights, and to prescribe and carry out the plans f the construction of said wharves, piers, and bulkheads.

SECTION 1. *Be it enacted by the senate and house of representatives of the Commo wealth of Pennsylvania in general assembly met, and it is hereby enacted by the authori of the same,* That it shall and may be lawful for cities of the first class to purcha and hold, in fee simple, any and all properties and improvements extending into t navigable streams in front of said cities, and the rights and privileges appertainin thereto, and to totally remove, alter, or modify the location, dimensions, or charact of construction of the same, in conformity with the plans and lines established by t Secretary of War, under the authority of Congress, in order to improve and furth the commercial interests of the said cities and of this Commonwealth: *Provided*, That such action shall be taken only in pursuance to and in conformity with the recommendation of the board of harbor commissioners, approved by the board of port wardens: *And provided further*, That such action shall be taken only in pursuance to ordinances therefor duly enacted by the councils of said cities, which said ordinances shall clearly define the character and extent of the treatment of said properties and improvements, respectively, so to be acquired for said purposes.

SEC. 2. That before such recommendation shall be made by the said boards they shall give due notice to the owner or owners of the properties to be affected that such recommendation is contemplated and that the parties will be heard in relation thereto, and when such recommendation as aforesaid, after such hearing shall have been made to councils and an ordinance passed in pursuance thereto, the owner or owners of the properties to be affected shall have notice, in writing, given to him or them by the department of public works of the fact that such properties will have to be removed, altered, or modified, and of all the particulars of the treatment to be accorded to the same, as embraced in the said ordinance, and should the owner or owners, after the receipt of said notice, fail for the period of six months thereafter to commence and prosecute the work of removal or reconstruction as prescribed in the said notice, said cities shall have power to condemn and appropriate said properties and improvements and riparian rights, and the fee simple thereto shall become vested in the said cities for the purposes as recited in the first section of this act: *Provided*, That the owner or owners of said properties and rights so purchased or taken shall receive compensation therefor in the mode provided for ascertaining damages by reason of change of grade of streets in cities of the first class, excepting that there shall be no assessment of benefits upon properties in the immediate vicinity.

SEC. 3. That within thirty days after the passage of the ordinance or ordinances above recited said owner or owners shall have the right to petition the court of common pleas of the county in which such city may be situated setting forth the facts of the case and the ground of the petitioner's complaint, and thereupon said court, after having caused due notice of the presentation of said petition and of the time fixed for the hearing thereof to be given to the parties in interest, shall proceed to hear and determine said matter of said petition, and shall declare either that said ordinance shall be operative or inoperative, and make such order for the payment of costs as justice may require, said decision to be subject to review by the supreme court in the same manner as now provided with reference to proceedings in equity.

SEC. 4. In all cases where the treatment of the respective properties involves merely the removal of an existing wharf or pier to the bulkhead or arbitrary low-water line, and the owner of the wharf or pier so to be removed is also the owner of the bulkhead, wharf, or riparian rights adjoining to and extending beyond the riparian rights attached and belonging to such wharf or pier so to be removed, the condemnation proceedings above referred to shall extend only to the acquisition of the materials composing said wharf or pier so to be removed, and damages for the appropriation and removal of the same only shall be assessed and paid, the purpose of this provision being to leave in the riparian owner or owners all the legal rights and privileges appertaining to said bulkheads, the same to be exercised by him or them under the laws of this Commonwealth.

INCLOSURE E.—APPENDIX NO. 81.

PHILADELPHIA, *May 18, 1893.*

To the select and common councils of the city of Philadelphia:

GENTLEMEN: We, your committee of surveys, to whom was referred the message of the mayor returning without his approval "An ordinance to authorize the revision of the lines and grades of Delaware avenue, between Christian and Otis streets, so as to widen the same to a width of 150 feet," and also "An ordinance to authorize the revision of lines and grades of Delaware avenue from Christian street to the angle in said Delaware avenue northeast of Laurel street, and to make the width thereof not less than 150 feet," beg leave to report, that careful consideration was given the subject, and an opportunity given to all persons interested to be heard. The annexed ordinance seems to meet the approval of the various interests involved. We therefore ask for favorable consideration of the same.

D. C. Cleaver, Watson D. Upperman, H. T. Pigot, W. F. Short, John Stewart, P. A. McClain, Edward Morrell, Wm. Findlay Brown, Dr. C. Schaufler, Samuel W. Baizley, Jacob J. Seeds, Wm. Horrocks, Wm. G. Rutherford, J. Emory Byram, Hiram A. Miller, Wm. Loudenslager.

AN ORDINANCE to authorize the revision of lines and grades of Delaware avenue from Christ street to the angle in said Delaware avenue northeast of Laurel street. and to make the wi thereof not less than 150 feet.

Whereas, in accordance with the provisions of an act of assembly approved Ju 8, 1891, and an ordinance of councils approved October 7, 1891, the board of harl commissioners for the city of Philadelphia has filed in the department of pul works, bureau of surveys, a plan establishing a new bulkhead line for the Phi delphia Harbor front between Moore street and Otis street, which line is fixed at distance of about 150 feet from the present westerly line of Delaware avenue;

And whereas in the contemplated improvements of the Philadelphia Harbor fr it is designed to widen Delaware avenue and to construct a continuous bulkh along this easterly line: Therefore,

SECTION 1. *The select and common councils of the city of Philadelphia do orda* That the department of public works be, and is hereby, authorized to revise the li and grades of Delaware avenue from Christian street to the angle in said Delaw avenue northeast of Laurel street, and to make the width thereof not less than feet, and to make the easternmost line conform to the bulkhead line established the Secretary of War.

G 3.

IMPROVEMENT OF SCHUYLKILL RIVER, PENNSYLVANIA.

This river, between its mouth and Gibson Point, in its unimprov condition, carried a channel over the bar directly at its mouth witl depth of about 10 feet at mean low water, and between the bar a Gibson Point a ruling depth of about 16 feet.

The original project proposed the formation of a channel 400 f wide and 24 feet deep at mean low water from the mouth of the riv to Girard Point, a distance of about 1 mile; from thence to Gibs Point, a farther distance of about 3 miles, a channel 20 feet deep a 250 feet wide, except at the abrupt bend at Yankee Point, where t channel width was to be increased to 300 feet; from thence to Chestn Street Bridge, Philadelphia, a distance of about 3 miles, a channel navigable width and 18 feet deep at mean low water. This latter rea of river has required no other improvement than the removal of ab 1,000 cubic yards of rock near Locust and South streets.

This work was to be done entirely by dredging, and its cost was es mated at $485,000. Although the work has been considerably increas by shoaling, it can be completed at a total cost of $485,750.

The results of a large part of the work executed between Gira Point and the mouth having proved to be temporary, the project w modified in 1892 so as to provide for the construction of dikes on t west side of the mouth, at an estimated cost of $44,209. The estimat cost of the whole modified project is $529,959.

The improvement of the channel of the Schuylkill River by dredgi was commenced in 1870, and up to the close of the fiscal year endi June 30, 1892, about 1,416,000 cubic yards of material had been remov of which about 550,000 cubic yards were dredged in deepening the ch nel near the mouth between the Delaware River and Girard Point distance of about 1 mile. The remaining 866,000 cubic yards w removed from between Girard Point and Gibson Point, a distance about 3 miles. A dangerous obstruction to navagation, consisting about 400 cubic yards of material, was also removed from the chan above Penrose Ferry Bridge.

During the past fiscal year two earthen dikes having an aggregate length of 2,797 feet were constructed under the contract with Frank C. Somers, the work being completed on September 14, 1892, at a cost of $1,880.71.

A pile dike 800 feet in length, filled with material dredged from the channel of the river, was constructed under the contract with B. G. Bailey, the work being completed on April 17, 1893, at a cost of $14,137.84, including $519.14 paid to the contractor under an open-market agreement for extra work in strengthening the dike.

Under date of November 17, 1892, a contract was entered into with the American Dredging Company, of Philadelphia, Pa., for the removal by dredging of about 170,000 cubic yards of material, scow measurement. Work under this contract is in progress, 98,148 cubic yards having been removed.

Under an open-market agreement, dated June 12, 1893, with George C. Platt, of Philadelphia, Pa., the dikes were strengthened in several places where they had been slightly injured during the past winter, at a cost of $262.05.

This work has resulted in the formation of a channel about 150 feet wide, and from 18 to 20 feet deep at mean low water across the bar at the river's mouth; a channel about 250 feet wide and from 20 to 24 feet deep from inside the bar to three-fourths of a mile above Point Breeze, except at Yankee Point, where the width is 300 feet, and from three-fourths of a mile above Point Breeze to Gibson Point, a channel from 100 to 200 feet wide and from 18 to 20 feet deep. Between Gibson Point and deep water inside the bar at the mouth the improved channel has maintained the depth to which it was dredged. An examination made at the close of the past fiscal year shows that the channel near the mouth has deepened materially at a point opposite the upper end of the pile dike, but the dike has not been sufficiently extended to produce any decided effect upon the bar. Should funds be available it is proposed to apply them to dike construction and to dredging over the bar if found necessary.

The present demands of commerce limit the requirement of an improved channel to that part of the river lying between the mouth and Gibson Point, or the lower 4 miles of the river. At Girard Point are located large grain elevators and wharves. At Gibson Point and and Point Breeze, which are near each other and closely related as to commercial requirements, are the large storage tanks and wharves of the petroleum oil refineries. The interests assembled at these three points cover mainly the commerce of the Schuylkill River, and both the grain and oil trade require deep-draft vessels for the proper and economical transaction of their business. Channel depths should exist which will permit the passage of vessels drawing 24 feet of water at all stages of the tide between the mouth of the river and Gibson Point.

The dredged channels which have been formed elsewhere than at the mouth have been permanent, and if by regulating works at the mouth a 24-foot channel can be maintained, it is believed that a permanent channel of equal depth can be formed by dredging in the reach of river between the mouth and Gibson Point. Until such a channel is formed deep-draft vessels can only be moved at high water, unless they lighter a part of their cargoes over the outer bar.

This work lies in the collection district of Philadelphia, at which, as a port of entry, there was collected during the year ending December 31, 1892, revenue to the amount of $10,886,475.42. The nearest fort and light-house are, respectively, Fort Mifflin and Schuylkill River range lights.

APPROPRIATIONS.

Act of—		Act of—	
June 11, 1870	$15, 000	March 3, 1881	$40,
March 3, 1871	10, 000	August 2, 1882	25,
June 10, 1872	40, 000	July 5, 1884	25,
March 3, 1873	40, 000	August 5, 1886	18,
June 23, 1874	20, 000	August 11, 1888	25,
March 3, 1875	20, 000	September 19, 1890	45,
August 14, 1876	20, 000	July 13, 1892	46,
June 18, 1878	30, 000		
March 3, 1879	25, 000	Total	485,
June 14, 1880	40, 000		

EXPENDITURES.

Total to June 30, 1893	$453, 784.

Money statement.

July 1, 1892, balance unexpended		$23, 718.
Amount appropriated by act approved July 13, 1892		46, 250.
		69, 968.
June 30, 1893, amount expended during fiscal year		38, 752.
July 1, 1893, balance unexpended		31, 215.
July 1, 1893, outstanding liabilities	$2. 176. 46	
July 1, 1893, amount covered by uncompleted contracts	14, 011. 14	
		16, 187.
July 1, 1893, balance available		15, 027.
Amount (estimated) required for completion of existing project		44, 959.
Amount that can be profitably expended in fiscal year ending June 30, 1895		44, 959.

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for dredging in Schuylkill River, Pennsylvania, opened Septem 28, 1892, by Maj. C. W. Raymond, Corps of Engineers.

[Approximate quantity of material to be removed, 170,000 cubic yards, measured in scows.]

No.	Name and address of bidder.	Price per cubic yard.	Amou
1	Frank C. Somers, Camden, N. J	$0. 23	$39, 10
2	National Dredging Co., Wilmington, Del	. 23	39. 10
3	John J. Carberry, Philadelphia, Pa	. 16	27, 2
4	American Dredging Co., Philadelphia, Pa	. 20	34, 00
5	Atlas Dredging Co., Wilmington, Del	. 23	39, 10

Any necessary dredging of hard material, such as compact gravel, clay, or bowlde to be paid for at the rate of one and a half times the price bid for ordinary materi

Lowest bidder declined to enter into contract; work readvertised.

Abstract of proposals for dredging in Schuylkill River, Pennsylvania, opened Novem 14, 1892, by Maj. C. W. Raymond, Corps of Engineers.

[Approximate quantity of material to be removed, 170,000 cubic yards, measured in scows.]

No.	Name and address of bidder.	Price per cubic yard.	Amou
1	Frank C. Somers, Camden, N. J	$0. 19⅞	$33, 78
2	American Dredging Co., Philadelphia, Pa	. 19½	33, 15

Any necessary dredging of hard material, such as compact gravel, clay or bowlde to be paid for at the rate of one and a half times the price bid for ordinary materi

Contract (dated November 17, 1892) entered into with American Dredging Co pany. In progress.

COMMERCIAL STATISTICS.

The following statements of the foreign and domestic commerce of the Schuylkill River for the years ending December 31, 1891 and 1892, have been compiled from the returns made to this office by shippers and consignees:

Freight movement.

Articles.	1891.		1892.	
	Gross tons.	Value.	Gross tons.	Value.
ARRIVING.				
Asphalt	15,160	$238,600	17,600	$263,600
Chemicals	4,066	70,518	3,280	80,916
Coal	250,892	878,962	213,164	738,876
Clay	6,618	19,824	6,618	19,864
Hay	1,458	11,440	1,422	11,220
Ice	137,331	270,162	179,527	329,626
Iron ore	40,179	104,475	56,191	147,129
Lumber	20,086	135,750	27,891	249,386
Marble	5,483	158,613	5,579	161,582
Stone, building	15,731	160,295	42,420	261,882
Stone, paving	29,508	128,145	13,350	44,875
Sand	219,250	138,090	242,840	150,973
Wood	32,328	159,395	30,828	150,895
Miscellaneous	83,301	319,947	13,878	287,633
Total	811,331	2,794,216	854,588	2,898,457
DEPARTING.				
Asphalt	2,478	74,340	2,478	74,340
Grain	122,691	4,272,140	392,001	9,622,983
Manure	28,910	32,435	28,327	32,615
Petroleum oil and products	705,091	13,864,383	841,536	13,597,166
Coal	....	....	5,093	14,279
Miscellaneous	6,435	107,907	40,520	479,626
Total	865,605	18,351,205	1,309,955	23,821,009

Vessel movement.

Class.	1891.		1892.	
	Number arriving loaded.	Number departing loaded.	Number arriving loaded.	Number departing loaded.
Steamers	912	1,168	610	1,076
Sailing vessels	580	287	665	272
Barges and canal boats	3,128	870	2,870	1,108
Total	4,620	2,325	4,145	2,456

Fifty-seven vessels had a registry of 2,000 to 2,800 tons. Five hundred and thirteen vessels were reported as drawing 18 to 27 feet of water. The drafts given are for the full loads in the Delaware River, just before entering and just after leaving the Schuylkill. Thirty-five barges and lighters conveyed portions of inbound cargoes from the Delaware up to the Schuylkill, and 198 barges and lighters conveyed portions of outgoing cargoes from the Schuylkill to the Delaware, owing to insufficient depth of water in the Schuylkill River for the deep-draft vessels.

G 4.

IMPROVEMENT OF ICE HARBOR AT MARCUS HOOK, PA.

The harbor of Marcus Hook is situated on the right bank of the Delaware River, about 20 miles below Philadelphia. Its construction an maintenance as an ice harbor was undertaken by the General Government in 1866.

The work accomplished in 1889 practically carried the project for th improvement of this harbor to completion. The harbor in its presen condition consists of an area of 10 acres, with a depth of from 18 to 2 feet at mean low water over about 7½ acres, and from 18 to 12 feet ove the remaining 2½ acres. Within this area are seven detached ice piers consisting of stone superstructures upon timber-crib substructures, tw landing or shore piers of timber with crib substructures upon pile foundations, and three groups of mooring piles placed between the detache ice piers.

The four upper ice piers were completed in 1871, and during th twenty-one years which have elapsed the wear of the ice upon the uppe surfaces of the timber substructure, which is but slightly below th plane of mean low water, will necessitate, in the near future, repairs t this worn part of the substructure.

It is also probable that dredging will have to be resorted to at intervals to maintain the requisite depth of the water in the harbor.

During the past fiscal year two landing piers were repaired, seve groups of mooring piles were established to replace those which ha decayed, and one group was repaired under a contract entered into o June 20, 1892, with Davis & Irvin, of Philadelphia. This work wa completed on July 22, 1892, at a cost of $1,067.16.

The past winter has been one of unusual severity, the river havin been for a long period greatly obstructed by large fields of heavy ic The damages to this harbor from ice and vessels have been comparatively small. Their character and extent are shown in the accompanying report of Second Lieut. A. M. D'Armit, Corps of Engineers, date May 9, 1893. The cost of the necessary repairs is estimated at abou $260. It is proposed to make these repairs during the current workin season.

The funds now available are considered sufficient for all probab necessities.

This work is located in the collection district of Philadelphia. This is the near port of entry, the collections during the year ending December 31, 1892, amounti to $10,886,475.42. The nearest fort and light-house are, respectively, Fort Miffl and Christiana Light.

APPROPRIATIONS.

Act of—		Act of—	
June 23, 1866	$5,000	August 5, 1886	$15,0
March 2, 1867	94,000	August 11, 1888	15,0
January 14, 1880	35,000	September 19, 1890	5,0
March 3, 1881	30,000		
August 2, 1882	15,000	Total	214,0

EXPENDITURES.

Total to June 30, 1893 .... $210,635.

Money statement.

July 1, 1892, balance unexpended	$5,000.
June 30, 1893, amount expended during fiscal year	1,635.
July 1, 1893, balance unexpended	3,364.

REPORT OF INSPECTION OF ICE HARBOR AT MARCUS HOOK, PA., BY LIEUT. A. M. D'ARMIT, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Philadelphia, Pa., May 9, 1893.

MAJOR: I have the honor to report that to-day, in company with Mr. Thomas G. Locke, I visited and inspected the ice harbor at Marcus Hook. I find that on the whole very little damage has been done during the unusually severe winter just passed. I carefully inspected each of the eight piers, the two wharves, and the clusters of mooring piles. The following notes will indicate the amount and nature of the damages.

Inner pier, upper line, southwest corner has been badly jammed by the bow of some vessel, causing the displacement of several of the stones. The stability of the pier is in no way impaired, and repairs would necessitate a tearing down and rebuilding of about one-quarter of the whole superstructure. The better plan will be to allow the pier to remain in its present condition. If it should receive any subsequent damage it will be as easy to repair then as now, and if it does not its present strength is amply sufficient for all requirements.

Inner pier, second row, has been run into by bow of vessel, breaking the iron steps, but inflicting no material damage to the pier. The steps should be repaired.

Upper wharf, upper cluster of fender piles pushed over. Should be straightened. On same wharf both inner mooring posts have been pulled out. Should be replaced.

Cluster of mooring piles between first and second row of piers has been knocked down and probably lies on bottom. Should be removed and new piles put in place.

Inshore line of mooring piles, third group, has been pulled over slightly. All of the old cluster are worn and broomed. No repairs to these are necessary.

On sounding at various points of the harbor I found the depth of 24 feet to be well maintained.

The location of the pipe line recently built across the harbor is not such as to impair the value of the harbor in my opinion.

Mr. Locke has been instructed to make a detailed estimate of the repairs, above indicated as necessary, which will be submitted soon.

Very respectfully, your obedient servant,

A. M. D'ARMIT,
Second Lieut., Corps of Engineers.

Maj. C. W. RAYMOND,
Corps of Engineers.

G 5.

ICE HARBOR AT HEAD OF DELAWARE BAY, DELAWARE.

The act of August 2, 1882, contained an appropriation of $25,000 for "ice harbor at head of Delaware Bay, and for removal of sunken piers in channel back of Reedy Island, Delaware." The sum of $3,700 was expended in 1883 in removing the sunken piers at Reedy Island, and $5,063.07 has since been expended in surveys, examinations, and office expenses.

Several plans for the formation of an ice harbor in the vicinity of Liston Point have been proposed, but the difficulties connected with the problem have been such that a satisfactory solution has not yet been reached. Those who have studied the question are unanimous in the opinion that if such an ice harbor is built it should be located in the reach of river between Reedy Island and Bombay Hook Point. This part of the river contains two localities—viz, Baker Shoal and Duck Creek Flats—the improvement of which is provided for in the project for the permanent improvement of the Delaware River, between Philadelphia and the sea, by the construction of over 11 miles of dikes. The changes which would be induced in the regimen of this part of the river by such extensive constructions would render the prior location of an ice harbor very hazardous.

The greatest need of commerce on the Delaware River is an improved ship channel between the port of Philadelphia and the sea, and until this shall have been carried further toward accomplishment, expenditures can be applied with more advantage to channel improvements than to ice-harbor construction.

The cost of an adequate ice harbor in the vicinity of Liston Point would probably be from $400,000 to $600,000, and after other requirements of commerce have been met, such an ice harbor would be a desirable adjunct.

APPROPRIATIONS.

Act of August 2, 1882	$25,000.00

EXPENDITURES.

Total to June 30, 1893	$8,763.07

Money statement.

July 1, 1892, balance unexpended	$16,236.93
July 1, 1893, balance unexpended	16,236.93

G 6.

CONSTRUCTION OF IRON PIER IN DELAWARE BAY, NEAR LEWES, DEL.

The construction of this pier was commenced in 1871 under an appropriation of $225,000 made in the river and harbor act of July 15, 1870. By the conditions of this act the Junction and Breakwater Railroad Company, having the terminus of its line in the vicinity of the pier, was permitted "to extend their railroad upon and over said pier and to freely use said pier in connection with their said road, subject to such regulations and charges for maintenance and repairs as the Secretary of War may adopt." The pier was completed in 1880, and expenditures since that date have been applied to the repair and maintenance of the structure. The railroad company has not yet exercised its privilege of occupying the pier.

In 1888 and 1889 the pier was injured by the collision of vessels which had been driven from their moorings behind the adjacent breakwater by severe storms. About 120 linear feet of the pier was wrecked by these collisions, involving the destruction of 17 of the wrought-iron screw piles and their attachments.

The pier was thoroughly repaired in 1891 at a cost of $7,033. These repairs are described in detail in the Annual Report of the Chief of Engineers for 1891, p. 1074. There were no operations during the past fiscal year.

The right to use this pier for railway purposes, granted in the act of July 15, 1870, has never been exercised, and doubtless never will be, as the pier has not sufficient strength to safely support the weight of modern freight engines. It is therefore impossible to obtain any assistance from the railroad company in maintaining and repairing the structure. It is suggested that this right, having been waived for a period of thirteen years, be now revoked by Congress.

A large part of the timber superstructure is now greatly impaired by natural decay. The covering and some of the timbers are in a dangerous condition, and if the pier is to be maintained by the United States and used, as heretofore, for the general benefit of commerce, it should be thoroughly repaired as a matter of public safety. The cost of such repairs will not exceed $6,300.

The pier is of great use for the purposes of the engineer, light-house, and quarantine services. It is of very great value to vessels frequenting the breakwater harbor, especially in exceptional seasons, like last winter, when the harbor is packed with floating ice, rendering the anchorage dangerous. At such times vessels eagerly seek the shelter and protection of the pier.

During the ice period of last winter the pier suffered some injuries from ice or vessels. The cluster piles at the pier-head were broken and five fender piles were torn out. The repair of these injuries is estimated to cost about $650.

The need of clear regulations governing the use of this pier and the neighboring anchorage under the shelter of the Delaware Breakwater became very apparent last winter during the season of ice and storms, when the harbor was crowded with shipping. Such regulations would be useless unless some representative of the Government is present with authority to enforce them. Legislation providing for the establishment of such regulations with penalties for their enforcement and the appointment of a harbor master is respectfully recommended. By the appointment of one of the agents of the maritime exchange living on the breakwater a suitable person to fill this position can be obtained at very moderate cost. Since his services will only be occasionally required, a compensation not to exceed $20 per month is considered sufficient. A watchman at the pier to protect the Government property is necessary, and has heretofore been maintained at a cost of $10 per month. A small sum should also be kept on hand for urgent repairs of unexpected injuries. For this purpose $500 per year is considered sufficient.

In accordance with above recommendations the following estimate of funds required during the next fiscal year is respectfully submitted:

Repairs of superstructure	$6,300
Repairs of fender piles	650
Urgent repairs of unexpected injuries	500
Pay of harbor master	240
Pay of watchman	120
Total	7,810

This pier is in the collection district of Delaware, the nearest port of entry being Wilmington, where the amount of revenue collected during the year ending December 31, 1892, was $11,194.96. The nearest fort and light-house are, respectively, Fort Delaware and the Delaware Breakwater Light.

APPROPRIATIONS.

Act of—		Act of—	
July 15, 1870	$225,000	June 14, 1880	$10,000
June 23, 1874	10,000	March 3, 1881	10,000
March 3, 1875	25,000	August 2, 1882	13,000
March 3, 1875	15,000	April 4, 1890	10,000
August 14, 1876	30,000		
June 18, 1878	20,000	Total	378,500
March 3, 1879	10,500		

EXPENDITURES.

Total to June 30, 1893	$378,500

Money statement.

Amount that can be profitably expended in fiscal year ending June 30, 1895	$7,810.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

G 7.

IMPROVEMENT OF DELAWARE BREAKWATER, DELAWARE.

The Delaware Breakwater in its present condition consists of two detached structures of random stone rising about 13½ feet above high water, called respectively the breakwater and the ice-breaker. These structures were formerly separated by a gap about 1,350 feet in length.

The present project for the improvement contemplates the closing of the gap by the construction of a connecting breakwater. The project as originally adopted in 1882 provided for a substructure of random stone having its upper surface 12 feet below mean low water, with a superstructure formed of concrete in place. The project was modified in 1890 by establishing the level of the upper surface of the substructure at 15 feet below mean low water and providing for the construction of the superstructure of concrete blocks. It was again modified in 1891, and now provides for the closing of the gap by the deposition of random stone, so as to raise the structure to a height of 14 feet above the plane of low water, with a width at top of 20 feet; the width at low water to be 40 feet and the slopes below this plane to be such as may be formed by the action of the sea; between low water and the top the slopes to be about 1 on 0.7, formed by heavy stone laid in position.

Under date of July 24, 1892, an open-market agreement was made with the Brandywine Granite Company, of Wilmington, Del., for furnishing and depositing in the gap about 12,000 tons of stone at $2.17 per ton. This agreement was completed on October 12, 1892, the amount of stone deposited being 12,006 $\frac{860}{2240}$ tons. Under date of October 3, 1892, a contract was entered into with the Brandywine Granite Company, of Wilmington, Del., for furnishing and depositing in the gap about 7,031 tons of stone at $3.20 per ton. This contract was completed on November 23, 1892, the amount of stone deposited being 6,740 $\frac{50}{2240}$ tons. The total amount of stone deposited during the past fiscal year was 18,746 $\frac{910}{2240}$ gross tons. By this work the structure in the gap was raised to low water over its full length.

The total quantity of stone deposited under the present project is 154,481 gross tons.

The stone placed in the work during the last two fiscal years was deposited over a width of 40 feet, measured transversely to the axis of the gap between established lines, so as to bring the structure to the level of low water over the entire area and permit the slopes to be formed naturally under the action of the sea.

No detailed investigation of the slopes has been made since June, 1892, for lack of funds. The work has settled about 1 foot, and the slopes appear to have suffered little change. Although the past winter was unusually severe the work was not injured.

Should funds become available it is proposed to apply them to the construction of the superstructure and the strengthening of the slopes if necessary.

The increase in the dimensions of vessels since the present harbor was designed in 1822, and the shoaling which has ensued behind the breakwater, render the harbor in its present condition inadequate to the requirements of commerce. Upon the completion of the present project of closing the gap, additional anchorage area will be added to the harbor, and it is probable that the shoaling will cease and the anchorage be deepened.

Under favorable conditions the work can be completed in a single working season. Its immediate completion is urgently necessary, since the substructure, in its present condition, is a serious danger to navigation, being invisible at the higher stages of the tide. One vessel has been totally wrecked upon it and several others have been severely injured. It has been found impossible to mark it in such way as to insure the safety of coasting vessels. The appropriation of the whole amount necessary for the completion of the work is therefore recommended.

The maritime exchange, of Philadelphia, maintains a station on the breakwater, and through telegraph cables between the mainland and their station are in connection with the shipping of the harbor. The reports of the maritime exchange state that during the year 1892, 2,139 vessels, exclusive of tugs, fishing, and small coasting craft, anchored under the protection of the breakwater.

This work is situated in the collection district of Delaware. Wilmington is the nearest port of entry, at which the revenue collected during the year ending December 31, 1892, was $11,194.96. Fort Delaware is the nearest fort, and the Breakwater Light the nearest light-house.

APPROPRIATIONS.

Act of—		Act of—	
May 7, 1822	$22,700.00	August 30, 1852	$30,000.00
May 23, 1828	250,000.00	June 23, 1866	107,910.00
April 23, 1830	162,000.00	March 2, 1867	109,493.70
March 2, 1831	208,000.00	August 2, 1882	125,000.00
July 3, 1832	270,000.00	July 5, 1884	75,000.00
March 3, 1833	270,000.00	August 5, 1886	56,250.00
June 28, 1834	270,000.00	August 11, 1888	100,000.00
March 3, 1835	100,000.00	September 19, 1890	80,000.00
July 2, 1836	100,000.00	July 13, 1892	50,000.00
July 4, 1836 (survey)	1,000.00		
March 3, 1837	141,000.00	Total	2,678,353.70
July 7, 1838	150,000.00		

EXPENDITURES.

Total to June 30, 1893	$2,678,191.26
Total amount appropriated under present project to June 30, 1893	486,250.00
Total expenditures under present project to June 30, 1893	486,087.56

Money statement.

July 1, 1892, balance unexpended	$985.83
Amount appropriated by act approved July 13, 1892	50,000.00
	50,985.83
June 30, 1893, amount expended during fiscal year	50,823.39
July 1, 1893, balance unexpended	162.44
Amount (estimated) required for completion of existing project	270,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	270,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Freight statement.

Articles.	1891.		1892.	
	Gross tons.	Value.	Gross tons.	Valu
ARRIVING.				
Chemicals	1,800	$54,000	2,520	$75,
Coal	14,500	58,000	15,370	61,
Lime	3,600	15,000	4,500	18,7
Lumber	1,100	15,000	1,133	15.4
Manure	16,000	12,000	24,000	18,
General merchandise	5,000	300,000	5,650	339.0
Total	42,000	454,000	53,173	528,
DEPARTING.				
Chemicals	1,500	45,000	1,500	45,
Canned goods	1,500	60,000	1,500	60.
Molding sand	132,000	200,000	138,600	210.
Produce	3,000	180,000	3,000	180,
General merchandise	6,500	225,000	6,760	234,
Total	144,500	710,000	151,360	729,

G 9.

IMPROVEMENT OF ALLOWAY CREEK, NEW JERSEY.

The river and harbor act of September 19, 1890, contained an appropriation of $6,000 for the improvement of Alloway Creek, New Jersey This was the first appropriation made for the work.

Alloway Creek discharges into the Delaware River at a point 7 mile below Fort Delaware. Before improvement its channel had a natura mean low-water depth of more than 6 feet, extending 3½ miles above it mouth. Between this point and Quinton, a distance of 6½ miles, ther were nine bars, with minimum depths at mean low water of from 1.3 t 4 feet.

The project for its improvement was based upon a survey made i 1889, and proposed the improvement of the stream between Quinton N. J., and its mouth, a distance of 10½ miles, by the formation, b dredging, of a channel 6 feet deep at mean low water and 60 feet wide from Quinton to a point about 1,000 feet above the Upper Hancock Bridge from thence a channel of the same depth and 75 feet wide to the lowe side of the bar at the Square. At a locality in the creek known as th Canal, in addition to obtaining a channel of the dimensions above named the width of the stream is to be increased to about 150 feet between its low water lines. At the Square the dredged channel is to be supplemente by a deflecting dike about 500 feet in length, formed of the materia dredged from the adjacent bar, with its channel face protected by riprap of stone. The estimated cost of the work was $25,000.

During the years 1891 and 1892, 23,234 cubic yards of material wer removed by dredging from the shoal areas at the Square, Canal, an Upper Hancock Bridge, at a cost of $4,182,12.

Under date of October 13, 1892, a contract was entered into wit Frank C. Somers, of Camden, N. J., for the removal by dredging o about 12,400 cubic yards of material from the channel. This contrac was completed on June 28, 1893, by the aggregate removal of 15,00 cubic yards of material at a cost of $2,700.

The work already done has produced channels from 40 to 75 feet wid and 6 feet deep at mean low water through the worst bars at localitie known as the Square, Canal, and Upper Hancock Bridge, whereby about one-third of the work projected has been accomplished and navigation much improved.

This work is situated in the collection district of Bridgeton, N. J., which is the nearest port of entry, at which no revenue was collected during the year ending December 31, 1892. The nearest fort is Fort Delaware, and the Reedy Island Light is the nearest light-house.

APPROPRIATIONS.

Act of September 19, 1890	$6,000
Act of July 13, 1892	3,000
Total	9,000

EXPENDITURES.

Total to June 30, 1893	$8,821

Money statement.

July 1, 1892, balance unexpended	$400.39
Amount appropriated by act approved July 13, 1892	3,000.00
	3,400.39
June 30, 1893, amount expended during fiscal year	3,221.39
July 1, 1893, balance unexpended	179.00
Amount (estimated) required for completion of existing project	16,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	16,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for dredging in Alloway Creek, New Jersey, opened October 6, 1892, by Maj. C. W. Raymond, Corps of Engineers.

[Approximate quantity of material to be removed, 12,400 cubic yards.]

No.	Names and address of bidders.	Price per cubic yard.	Amount.
1	Atlas Dredging Co., Wilmington, Del	$0.25	$3,100.00
2	American Dredging Co., Philadelphia, Pa	.20	2,480.00
3	Frank C. Somers, Camden, N. J	.18	2,232.00

Contract (dated October 13, 1892) entered into with Frank C. Somers.

COMMERCIAL STATISTICS.

Arrivals and departures of vessels for years ending December 31, 1891 and 1892.

Kind of vessels.	Arrivals.				Departures.			
	1891.		1892.		1891.		1892.	
	No.	*Tons.*	*No.*	*Tons.*	*No.*	*Tons.*	*No.*	*Tons.*
Steamers	100	10,500	70	7,350	100	10,500	70	7,350
Sailing vessels	45	4,500	40	4,000	45	4,500	40	4,000
Canal boats	15	2,250	70	10,500	15	2,250	70	10,500
Total	160	17,250	180	21,850	160	17,250	180	21,850

Freight statement.

Articles.	1891.		1892.	
	Gross tons.	Value.	Gross tons.	Value.
ARRIVING.				
Chemicals	1,800	$54,000	2,520	$75,60
Coal	14,500	58,000	15,370	61,48
Lime	3,600	15,000	4,500	18,75
Lumber	1,100	15,000	1,133	15,45
Manure	16,000	12,000	24,000	18,00
General merchandise	5,000	300,000	5,650	339,00
Total	42,000	454,000	53,173	528,28
DEPARTING.				
Chemicals	1,500	45,000	1,500	45,00
Canned goods	1,500	60,000	1,500	60,00
Molding sand	132,000	200,000	138,600	210,00
Produce	3,000	180,000	3,000	180,00
General merchandise	6,500	225,000	6,760	234,00
Total	144,500	710,000	151,360	729,00

G 9.

IMPROVEMENT OF ALLOWAY CREEK, NEW JERSEY.

The river and harbor act of September 19, 1890, contained an appropriation of $6,000 for the improvement of Alloway Creek, New Jersey. This was the first appropriation made for the work.

Alloway Creek discharges into the Delaware River at a point 7 miles below Fort Delaware. Before improvement its channel had a natural mean low-water depth of more than 6 feet, extending 3½ miles above its mouth. Between this point and Quinton, a distance of 6½ miles, there were nine bars, with minimum depths at mean low water of from 1.3 to 4 feet.

The project for its improvement was based upon a survey made in 1889, and proposed the improvement of the stream between Quinton, N. J., and its mouth, a distance of 10½ miles, by the formation, by dredging, of a channel 6 feet deep at mean low water and 60 feet wide from Quinton to a point about 1,000 feet above the Upper Hancock Bridge; from thence a channel of the same depth and 75 feet wide to the lower side of the bar at the Square. At a locality in the creek known as the Canal, in addition to obtaining a channel of the dimensions above named, the width of the stream is to be increased to about 150 feet between its low-water lines. At the Square the dredged channel is to be supplemented by a deflecting dike about 500 feet in length, formed of the material dredged from the adjacent bar, with its channel face protected by a riprap of stone. The estimated cost of the work was $25,000.

During the years 1891 and 1892, 23,234 cubic yards of material were removed by dredging from the shoal areas at the Square, Canal, and Upper Hancock Bridge, at a cost of $4,182,12.

Under date of October 13, 1892, a contract was entered into with Frank C. Somers, of Camden, N. J., for the removal by dredging of about 12,400 cubic yards of material from the channel. This contract was completed on June 28, 1893, by the aggregate removal of 15,000 cubic yards of material at a cost of $2,700.

The work already done has produced channels from 40 to 75 feet wide and 6 feet deep at mean low water through the worst bars at localities known as the Square, Canal, and Upper Hancock Bridge, whereby about one-third of the work projected has been accomplished and navigation much improved.

This work is situated in the collection district of Bridgeton, N. J., which is the nearest port of entry, at which no revenue was collected during the year ending December 31, 1892. The nearest fort is Fort Delaware, and the Reedy Island Light is the nearest light-house.

APPROPRIATIONS.

Act of September 19, 1890	$6,000
Act of July 13, 1892	3,000
Total	9,000

EXPENDITURES.

Total to June 30, 1893	$8,821

Money statement.

July 1, 1892, balance unexpended	$400.39
Amount appropriated by act approved July 13, 1892	3,000.00
	3,400.39
June 30, 1893, amount expended during fiscal year	3,221.39
July 1, 1893, balance unexpended	179.00
Amount (estimated) required for completion of existing project	16,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	16,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for dredging in Alloway Creek, New Jersey, opened October 6, 1892, by Maj. C. W. Raymond, Corps of Engineers.

[Approximate quantity of material to be removed, 12,400 cubic yards.]

No.	Names and address of bidders.	Price per cubic yard.	Amount.
1	Atlas Dredging Co., Wilmington, Del	$0.25	$3,100.00
2	American Dredging Co., Philadelphia, Pa	.20	2,480.00
3	Frank C. Somers, Camden, N. J	.18	2,232.00

Contract (dated October 13, 1892) entered into with Frank C. Somers.

COMMERCIAL STATISTICS.

Arrivals and departures of vessels for years ending December 31, 1891 and 1892.

Kind of vessels.	Arrivals.				Departures.			
	1891.		1892.		1891.		1892.	
	No.	*Tons.*	*No.*	*Tons.*	*No.*	*Tons.*	*No.*	*Tons.*
Steamers	100	10,500	70	7,350	100	10,500	70	7,350
Sailing vessels	45	4,500	40	4,000	45	4,500	40	4,000
Canal boats	15	2,250	70	10,500	15	2,250	70	10,500
Total	160	17,250	180	21,850	160	17,250	180	21,850

Freight statement.

Articles.	1891.		1892.	
	Gross tons.	Value.	Gross tons.	Value.
ARRIVING.				
Coal	8,000	$27,000	12,000	$40, 0
Glass sand	1,500	2,250	2,500	3. 7
Tin plate	800	80,000	1,564	110. 0
Lumber	1,400	16,000	4,800	50. 5
Soda ash	400	12,000	525	15, 0
Oyster shells			2,143	5, 0
Merchandise			7,500	225, 0
Miscellaneous	3,000	6,000	2,109	47. 4
Total	15,100	143,250	33,141	496, 6
DEPARTING.				
Manufactured products	7,000	350,000		
Glass			2,480	150, 0
Canned goods			1,488	400, 0
Ship timber			250	5. 0
Grain and farm produce			8,348	75. 0
Miscellaneous	2,000	10,000		
Total	9,000	360,000	7,566	630, 0

G 10.

IMPROVEMENT OF SALEM RIVER, NEW JERSEY.

This river discharges into the Delaware River by its natural mout about 4 miles below Fort Delaware. At a point in the Delaware Rive about 10 miles above the natural mouth of the Salem River a canal wa constructed in 1872, by private enterprise, which connects with th Salem River at the point of its nearest approach to the Delaware. Jus below the junction of this canal with the Salem River a dam was buil dividing the stream into two parts; a lower part, from the natura mouth to the dam, and an upper part, from the mouth of the canal t the headwaters of the river. These parts are now essentially two independent streams.

The existing project, which provides for the improvement of the uppe Salem River, was adopted in 1881. It contemplated the removal of shoal near Biddle's Landing, over which there was a depth of from 3 t 5 feet at mean low water, and which was the main obstruction betwee the head of the canal and Course's Landing. The estimated cost wa $4,500.

The work done in 1881 and 1882 resulted in the formation of a channe 60 feet wide and from 6 to 7 feet deep at mean low water from the hea of the canal to a point about 200 feet above Biddle's Landing, leavin about 700 feet to be improved to reach deep water below Hoxie's Landing. It was then found that since the original examination in 1878 th shoals had largely increased, and it was estimated that from $4,000 t $6,000 would be required for the completion of the improvement.

The sum of $1,500 was appropriated in the river and harbor act o 1882 for the continuation of the improvement, but the smallness of th amount rendered the proposals for dredging excessive, and furthe work having been postponed the remaining balance of $1.490.66 wa passed to the surplus fund in 1890. Until the past fiscal year no wor has been executed in the upper Salem River since 1882.

During the past fiscal year a survey was made of the upper Salen River between the canal and Hoxie's Landing. This survey show that since 1882 there has been extensive shoaling in the improved channel and above it. In the improved channel the low-water depth has decreased from 6 or 7 feet to about 3.5 feet. Between the improved channel and Hoxie's Landing the low-water depth has decreased from about 6 feet to about 3.5 feet. The minimum low-water depth in the lower part of the canal is about 4 feet and the low-water depth over the bar at the mouth is less than 3 feet.

Under date of December 21, 1892, contract was entered into with Frank C. Somers, of Camden, N. J., for deepening the channel between the head of the canal and Hoxie's Landing by the removal by dredging of about 5,000 cubic yards of material, scow measurement. Work under this contract has not yet been commenced.

The re-dredging of a channel 50 feet wide and 6 feet deep at mean low water from deep water at the head of the canal to deep water below Hoxie's Landing will require the excavation of about 8,400 cubic yards of material, scow measurement. The cost is estimated at $4,200, but this estimate is very uncertain, owing to the unusual conditions attending the work. It is believed that the improvement will be temporary.

This work is situated in the collection district of Bridgeton, N. J., which is the nearest port of entry, at which no revenue was collected during the year ending December 31, 1892. The nearest fort is Fort Delaware, and the Reedy Island Light is the nearest light-house.

APPROPRIATIONS.

For lower part of river.

Act of—	
March 3, 1871	$4,000.00
June 18, 1878	3,000.00
June 14, 1880	3,000.00
Total	10,000.00

EXPENDITURES.

Total to June 30, 1883	$10,000.00

APPROPRIATIONS.

For upper part of river, present project

Act of—	
March 3, 1881	$3,000.00
August 2, 1882	1,500.00
July 13, 1892	2,500.00
Total	7,000.00

EXPENDITURES.

Total to June 30, 1893	$3,112.93
Carried to surplus fund in 1890	1,490.66

Money statement.

Amount appropriated by act approved July 13, 1892	$2,500.00
June 30, 1893, amount expended during fiscal year	103.59
July 1, 1893, balance unexpended	2,396.41
July 1, 1893, amount covered by uncompleted contracts	1,950.00
July 1, 1893, balance available	446.41
Amount (estimated) required for completion of existing project	1,700.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	1,700.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for dredging in Salem River, New Jersey, opened December 15, 18
by Maj. C. W. Raymond, Corps of Engineers.

[Approximate quantity of material to be removed, 5,000 cubic yards.]

No.	Name and address of bidder.	Price per cubic yard.	Amoun
1	American Dredging Co., Philadelphia, Pa	$0.45	$2, 250.
2	Frank C. Somers, Camden, N. J	.39	1, 950.

Contract (dated December 21, 1892) entered into with Frank C. Somers. In progres

COMMERCIAL STATISTICS.

Arrivals and departures of vessels for the year ending December 31, 1892.

Kind of vessels.	Arrivals.		Departures.	
	No.	*Tons.*	*No.*	*Tons.*
Steamers	299	5, 470	299	5, 47
Sailing vessels	70	960	70	96
Total	369	6, 430	369	6, 43

Freight statement.

Articles.	Gross tons.	Value.	Articles.	Gross tons.	Value.
ARRIVING.			DEPARTING.		
Provisions	5, 200	$80, 000	Coal	800	$3, 400
			Shells	750	985
			Phosphate	100	2, 000
			Manure	11, 900	16, 800
Total	5, 200	80, 000	Total	13, 550	23, 185

G II.

IMPROVEMENT OF GOSHEN CREEK, NEW JERSEY.

Goshen Creek rises in the central part of Cape May County and discharges into Delaware Bay about 15 miles north of Cape May. The project for its improvement was adopted in 1891. It contemplates the deepening and widening by dredging of the 4,000 feet of the creek below Goshen Landing to a low-water depth of 3 feet and a width of 30 feet; the formation of a dredged channel 3 feet deep and about 50 feet wide through the bar at the mouth and out to the limit of the sand formation beyond the low-water shore line; and the protection of the dredged channel by a sheet-pile jetty on the south side of the channel extending about 600 feet outside of the low-water line of the bay. The object of the improvement is to provide navigable mean low water for vessels plying between Goshen Landing and Delaware Bay. The estimated cost is $12,000.

At the time of the adoption of the present project the channel of this creek had a low-water depth of from 2 to 4 feet, with a minimum low-water width of 20 feet and a high-water width of 36 feet, from Goshen to a point about 4,000 feet below; and from thence to the mouth, a distance of about 2,500 feet, a low-water channel from 3 to 5 feet deep with a least width of 30 feet.

The work of improvement was commenced during the past fiscal year.

Under date of October 13, 1892, contract was entered into with Mr. Frank C. Somers for the removal by dredging of about 13,500 cubic yards of material from the creek below Goshen Landing. This work was completed on June 27, 1893, by the aggregate removal of 15,770 cubic yards of material.

The present condition of this improvement is as follows: A low-water channel 3 feet deep and 30 feet wide has been formed below Goshen Landing for a distance of 3,975 feet. By this work about one-fourth of the projected improvement has been completed, and the navigable conditions have been proportionately improved.

This work is situated in the collection district of Bridgeton, N. J., which is the nearest port of entry, at which no revenue was collected during the year ending December 31, 1892. The nearest fort is Fort Delaware, and the Maurice River Light is the nearest light-house.

APPROPRIATIONS.

Act of July 13, 1892	$3,000.00

EXPENDITURES.

Total to June 30, 1893	2,770.16

Money statement.

Amount appropriated by act approved July 13, 1892	$3,000.00
June 30, 1893, amount expended during fiscal year	2,770.16
July 1, 1893, balance unexpended	229.84
Amount (estimated) required for completion of existing project	9,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	9,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

Abstract of proposals for dredging in Goshen Creek, New Jersey, opened October 6, 1892, by Maj. C. W. Raymond, Corps of Engineers.

[Approximate quantity of material to be removed, 13,500 cubic yards.]

No.	Name and address of bidder.	Price per cubic yard.	Amount.
1	American Dredging Co., Philadelphia, Pa	$0.18	$2,430.00
2	Atlas Dredging Co., Wilmington, Del	.16	2,160.00
3	Frank C. Somers, Camden, N. J	.14$\frac{9}{10}$	2,011.50

Contract (dated October 13, 1892) entered into with Frank C. Somers.

COMMERCIAL STATISTICS.

Arrivals and departures of vessels for the year ending December 31, 1892.

Kind of vessels.	Arrivals.		Departures.	
	No.	*Tons.*	*No.*	*Tons.*
Sailing vessels	850	12,750	850	12,750

Freight statement.

Articles.	Gross tons.	Articles.	Gross tons.
ARRIVING.		DEPARTING.	
Lumber	1,200	Wood	6,000
Coal	1,000	Potatoes	120
Grain	1,600	Hay	200
Fertilizers	25	Oysters	1,500
General merchandise	1,200	Total	7,820
Total	5,025		

G 12.

REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGERING NAVIGATION.

During the past fiscal year seven wrecks have been removed under the authority of the act of Congress approved June 14, 1880.

In November, 1884, the iron steamship *Gaudaloup* was sunk just east of the outer bar at Barnegat Inlet, New Jersey, in water about 15 feet deep. The wreck being a dangerous obstruction to vessels passing through Barnegat Inlet its removal was recommended.

In 1865 the steamtug *Starlight* was sunk in mid-channel of Barnegat Inlet, New Jersey, inside the bar. The wreck being a dangerous obstruction to vessels passing through Barnegat Inlet its removal was recommended.

Under date of September 1, 1892, a contract was entered into with Enoch Townsend for the removal of the wrecks of the steamship *Gaudaloup* and tug *Starlight* for the sum of $4,765. The work was completed on November 7, 1892.

In April, 1892, the side-wheel steamship *Florida* was sunk about 1¾ miles offshore from the Excursion House at Atlantic City, N. J., in water about 30 feet deep. The wreck being a dangerous obstruction to vessels engaged in the coasting trade its removal was recommended. Under date of October 7, 1892, a contract was entered into with Van Sant & Kelly for the removal of the wreck for the sum of $944. The work was completed on November 12, 1892.

In September, 1889, the sailing ship *Geestemunde* was sunk off the coast of New Jersey, about 3 miles south of Absecon Inlet and about 1,000 feet out from the low-water line. The wreck being a dangerous obstruction to the small traders approaching the inlet its removal was recommended. Under date of October 7, 1892, a contract was entered into with Van Sant & Kelly for the removal of the wreck for the sum of $672. The work was completed on December 5, 1892.

In September, 1892, the schooner *Marcia S. Lewis* was sunk in the entrance to Great Egg Harbor Inlet, New Jersey, about 1,200 yards off the beach at Ocean City, in water about 12 feet deep. The wreck being a dangerous obstruction to small coasting vessels following the inlet trade its removal was recommended. Under date of January 10, 1893, a contract was entered into with Townsend & Johnston for the removal of the wreck for the sum of $465. The work was completed on February 8, 1893.

In November, 1892, the schooner *Annie S. Gaskill* was sunk off the entrance to Delaware Bay, about 12 miles eastward of Cape Henlopen Light, in water about 45 feet deep, and directly in the path of ocean steamers going to and from Delaware Bay and River. The wreck being a dangerous obstruction to navigation its removal to a depth of 36 feet was recommended.

In January, 1892, the barge *McClellan* was sunk off the entrance to Delaware Bay, about 9 miles eastward of Cape Henlopen Light, in water about 60 feet deep. The three masts of the vessel were standing, one of which projected 3 feet above low water, and these parts forming dangerous obstructions to vessels going to and from Delaware Bay and River, the removal of all portions projecting above the hull of the wreck to a depth of 36 feet was recommended.

Under date of February 20, 1893, a contract was entered into with Townsend & Johnston for the removal of the wrecks of the schooner *Annie S. Gaskill* and barge *McClellan* for the sum of $1,265. The work was completed on March 7, 1893.

In October, 1892, the iron bark *Felix* was sunk in the channel of Schuylkill River near Point Breeze. The vessel was lying in a position directly across the channel and prevented many vessels from navigating the river. The wreck being a dangerous obstruction to navigation its removal was recommended. The obstruction was removed on December 28, 1892, the vessel having been raised by interested parties without expense to the United States further than the cost of advertising the legal notice to interested persons.

In 1892, the canal boat *Francis J. Henry* was sunk in Cooper Creek, New Jersey, about 3 miles above the mouth of the creek and near the line of the city of Camden. As this wreck was lying in mid stream and completely obstructed navigation its removal was recommended. The proposals received and opened on March 7, 1893, were rejected, and further action toward the removal of the wreck by the General Government was considered unnecessary, information having been received that the board of freeholders of Camden County, N. J., were removing the wreck under a contract made by them with B. F. Sweeten & Son, the cost of the work to be paid for by Camden County. The wreck was removed accordingly.

In May, 1893, the three-masted schooner *Booth Brothers* was sunk on Brigantine Shoal, New Jersey, about 3½ miles east from the South Brigantine Life-Saving Station. The wreck being a dangerous obstruction to vessels engaged in the coasting trade its removal was recommended. The wreck will be removed during the fiscal year ending June 30, 1894.

In May, 1893, the canal boat *General Grant* was sunk in the channel of the Delaware River, about 950 feet off the foot of Bridge street, Bridesburg, Pa. The wreck being a dangerous obstruction to vessels navigating the river above Philadelphia its removal was recommended. The wreck will be removed during the fiscal year ending June 30, 1894.

Abstract of proposals for removal of the wrecks of the steamship Guadaloup and tu Starlight, lying near the outer bar at Barnegat Inlet, New Jersey, opened August 2 1892, by Lieut. A. M. D'Armit, Corps of Engineers.

No.	Name and address of bidder.	Price for removal of both wrecks.
1	Enoch Townsend, Somers Point, N. J	4, 76
2	B. G. Bailey, Philadelphia, Pa	14. 40
3	Atlantic and Gulf Wrecking Co., Somers Point, N. J	9. 20
4	Charles W. Johnston, Lewes, Del	6, 60

Contract (dated September 1, 1892) entered into with Enoch Townsend.

Abstract of proposals for removal of the wreck of the steamship Florida, lying about 1 miles offshore from the Excursion House, at Atlantic City, N. J., opened September 29 1892, by Maj. C. W. Raymond, Corps of Engineers.

No.	Name and address of bidder.	Price.
1	Chapman Derrick and Wrecking Co., New York, N. Y	$11, 77
2	B. G. Bailey, Philadelphia, Pa	9, 60
3	Enoch Townsend, Somers Point, N. J	2, 45
4	Charles W. Johnston, Lewes, Del	1, 49
5	Gilbert M. Van Sant and Cornelius J. Kelly, Atlantic City, N. J	94

Contract (dated October 7, 1892) entered into with Van Sant & Kelly.

Abstract of proposals for removal of the wreck of the ship Geestermunde, lying about miles south of Absecon Inlet, New Jersey, opened September 29, 1892, by Maj. C. W Raymond, Corps of Engineers.

No.	Name and address of bidder.	Price.
1	B. G. Bailey, Philadelphia, Pa	$2, 80
2	Charles W. Johnston, Lewes, Del	2, 10
3	Gilbert M. Van Sant and Cornelius J. Kelly, Atlantic City, N. J	67
4	Chapman Derrick and Wrecking Co, New York, N. Y	8. 47
5	Enoch Townsend, Somers Point, N. J	1, 82

Contract (dated October 7, 1892) entered into with Van Sant & Kelly.

Abstract of proposals for removal of the wreck of the schooner Marcia S. Lewis, lying in the entrance to Great Egg Harbor Inlet, New Jersey, opened January 5, 1893, by Maj. C. W. Raymond, Corps of Engineers.

No.	Name and address of bidder.	Price.
1	Enoch Townsend and Charles W. Johnston, Somers Point, N. J	$46
2	Gilbert M. Van Sant and Cornelius J. Kelly, Atlantic City, N. J	91

Contract (dated January 10, 1893) entered into with Townsend & Johnston.

Abstract of proposals for removal of the wrecks of the schooner Annie S. Gaskill and barge McClellan, lying off the entrance to Delaware Bay, opened February 14, 1893, by Lieut. A. M. D'Armit, Corps of Engineers, in the absence of Maj. C. W. Raymond, Corps of Engineers.

No.	Name and address of bidder.	Price for removal of both wrecks.
1	Kelley & Van Sant, Atlantic City, N. J	$1, 424
2	Townsend & Johnston, Somers Point, N. J	1, 265
3	Joseph D. Truxton, Lewes, Del	3, 645

Contract (dated February 20, 1893) entered into with Townsend & Johnston.

Abstract of proposals for removal of the wreck of the canal boat Francis J. Henry, lying in Cooper Creek, New Jersey, opened March 7, 1893, by Maj. C. W. Raymond, Corps of Engineers.

No.	Name and address of bidder.	Price.
1	Samuel S. Davis, Philadelphia, Pa	$574
2	Kelly & VanSant, Atlantic City, N. J	215
3	D. A. Johnston, Camden, N. J	290
4	Johnston & Townsend, Somers Point, N. J	465

All bids rejected; wreck removed at the expense of Camden County, N. J.

G 13.

PRELIMINARY EXAMINATION OF BARNEGAT INLET, ENTRANCE AND HARBOR, NEW JERSEY.

[Printed in House Ex. Doc. No. 16, Fifty-second Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 5, 1892.

SIR: I have the honor to submit the accompanying copy of report, dated August 13, 1892, by Maj. Charles W. Raymond, Corps of Engineers, of the results of a preliminary examination of Barnegat Inlet (entrance and harbor), New Jersey, made to comply with requirements of the river and harbor act approved July 13, 1892.

It is the opinion of Maj. Raymond, concurred in by the division engineer and by this office, that the locality is not worthy of improvement by the General Government.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

Hon. S. B. ELKINS,
Secretary of War.

REPORT OF MAJ. C. W. RAYMOND, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Philadelphia, Pa., August 13, 1892.

GENERAL: In compliance with instructions contained in Department letter dated July 14, 1892, I have the honor to submit the following report upon a preliminary examination of Barnegat Inlet, entrance and harbor, New Jersey, in accordance with a provision of the river and harbor act approved July 13, 1892.

A large portion of the coast of New Jersey is separated from the sea by long low beaches of shifting sand. Through these beaches, at considerable intervals, there are inlets connecting the interior bays with the sea.

The improvement of some of these inlets in the interest of commerce has before received careful consideration. In 1887 an elaborate report upon the proposed improvement of Absecon Inlet was submitted by a board of engineers, and is published in the Annual Report of the Chief of Engineers for 1887, p. 815. In 1890, a report was submitted upon the proposed improvement of Little Egg Harbor Inlet, and is published in the Annual Report of the Chief of Engineers for 1891, p. 1095.

These inlets can only be improved by the construction of jetties transferring the gorge out to deep water beyond the point where sand will accumulate, and narrowing the entrance so as to assist in maintaining an increased depth by the scour of the tidal currents. The construction of such jetties upon a sandy coast is costly and uncertain. Owing to the instability of the beaches they require expensive works of shore protection. As shown by experience, the harbors thus formed are never good harbors of refuge, as they always lack accessibility. Finally, the channel depths through such entrances can not be permanently maintained without sluicing reservoirs or frequent dredging, unless the ebb currents are assisted by the outflow of a relatively large quantity of back water. The improvement of an inlet on a sandy coast is one of the most difficult problems in harbor engineering, and its cost and uncertainty is so great that it should only be attempted when necessary to improve the approach to some great port of commerce.

Barnegat Inlet is situated about 50 miles south of Sandy Hook, and forms the entrance to the largest bay inclosed between the beaches and the New Jersey coast. The inlet and the adjacent waters are used only by coasters of the smaller class, and the local commerce is unimportant.

The objects of the proposed improvement are the formation of a harbor of refuge and an entrance to the interior harbor of sufficient depth to be navigable at all stages of the tide. Such a harbor as it might be possible to construct without enormous expense for construction and maintenance would be useless for vessels engaged in the foreign trade. It would be only of service to the coastwise trade, which now employs vessels drawing 14 and 16 feet, with a constant tendency toward increase of draft. The depth of water in the channel and anchorages should therefore be not less than 20 feet.

The currents through the inlet maintain a low-water cross section of about 26,600 square feet, the low-water width being about 3,360 feet and the low-water mean depth nearly 8 feet. To maintain a channel depth of 20 feet, the entrance at the outer ends of the jetties would therefore have to be less than 1,000 feet in width. Such a harbor would doubtless increase the number of casualties instead of diminishing them, as has proved to be the case at the mouth of the Tyne, where the entrance between the jetties is much wider.

* * * * * * *

The possible benefits to be derived from the proposed improvement are not considered sufficient to justify the large expenditure required, especially in view of the uncertainty of obtaining permanent and satisfactory results. In my opinion, Barnegat Inlet is not worthy of improvement by the General Goverment.

Very respectfully, your obedient servant,

C. W. RAYMOND,
Major, Corps of Engineers

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. Henry L. Abbot, Corps of Engineers, Division Engineer, Northeast Division.)

[First indorsement.]

NORTHEAST DIVISION, ENGINEER OFFICE,
New York, August 20, 1892.

Respectfully forwarded to the Chief of Engineers, U. S. Army.

I concur with Maj. Raymond in his opinion, for the reasons herein stated, that this harbor is not worthy of improvement by the General Government.

HENRY L. ABBOT,
Colonel of Engineers, Bvt. Brig. Gen., U. S. A.,
Engineer Northeast Division.

G 14.

PRELIMINARY EXAMINATION OF DENNIS CREEK, NEW JERSEY.

[Printed in House Ex. Doc. No. 46, Fifty-second Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 5, 1892.

SIR: I have the honor to submit the accompanying copy of report, dated July 29, 1892, by Maj. C. W. Raymond, Corps of Engineers, of the results of preliminary examination of Dennis Creek, New Jersey, made to comply with provisions of the river and harbor act approved July 13, 1892.

It is the opinion of Maj. Raymond, concurred in by the division engineer and this office, that Dennis Creek is worthy of improvement by the General Government.

It is estimated that $250 will be required to make a survey of the creek with a view of submitting plan and estimate for its improvement.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

Hon. S. B. ELKINS,
Secretary of War.

REPORT OF MAJ. C. W. RAYMOND, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Philadelphia, Pa., July 29, 1892.

GENERAL: In compliance with instructions contained in Department letter dated July 14, 1892, I have the honor to submit the following report upon a preliminary examination of Dennis Creek, New Jersey, in accordance with a provision of the river and harbor act approved July 13, 1892.

Dennis Creek rises in the northern part of Cape May County, N. J., flows in a southwesterly direction, and empties into Delaware Bay about 20 miles above Cape May. The head of navigation is at the County Road Bridge, in the village of Dennis, about 9 miles by the devious course of the creek, and about 4½ miles, in a direct line, from the mouth. The creek runs in the middle of a valley, about three-fourths of a mile wide at Dennisville, gradually widening to 4 miles at the mouth. The valley was originally a cedar swamp throughout the course of the creek, but below the bridge it is now salt-meadow land,

just above ordinary high water, and is partly protected from overflo
by low mud banks. Four large streams empty into the creek at poin
3, 5, 6, and 7 miles below the bridge, having 8 to 10 feet high-wat
depth at their mouths. There are no bridges below Dennisvill
Timber wharves on each side of the creek extend from the bridge abo
600 feet downstream. There are two other landings at distances, r
spectively, of 1 and 3½ miles below the bridge, from which some woo
and hay are shipped.

From deep water in Delaware Bay to the mouth of the creek there
a high-water depth of not less than 8 feet, with several feet more
liquid mud so diluted as to offer no perceptible resistance to the pa
sage of vessels of 10 or 12 feet draft. From the mouth to a point 1
miles below the bridge the channel has a high-water depth of about 1
feet, varying in width from 300 to 150 feet, with steep banks. For th
remaining distance of 1½ miles to the bridge the channel has a bo
tom width of 60 to 70 feet and a width between banks of 80 to 100 fe
up to the docks, where both the top and bottom widths are about
feet. The mid-channel depth at high water over this last reach of 1
miles is about 5 feet. The range of tide is about 5 feet, so that ov
this reach the channel is bare at low water, except a channel of 15 fe
in width and 6 to 8 inches in depth formed by the backwater. Th
original depth of channel over this reach was about 7 feet, but abo
eight years ago a dam just above the bridge, formed to make a cra
berry bog, broke away, carrying the material of the dam and the a
cumulated sediment back of it down in this reach, shoaling it to a
average depth of 2 feet.

The improvement desired is the formation of a channel 60 feet wid
and 8 feet deep at high water from the bridge downstream about 1
miles, besides some increase in width at five bends within the reac
This would require the excavation of about 75,000 cubic yards of mu
All the material can be cast out upon the banks without objection fro
the land-owners. * * *

The population of Dennisville is estimated at 600. There are
sawmills, 2 gristmills, 2 blacksmith shops, 2 wheelwright shops,
stores, and 2 shipyards.

The following statistics of the commerce of the creek for the yea
1891 were furnished by the deputy collector for the district of Bridgeto

Articles.	Gross tons.	Value
ARRIVING.		
General merchandise	375	$15,0
Stone lime	90	2
Gas lime	536	7
Phosphates	100	3,0
Anthracite coal	1,000	5,0
Corn	250	6,0
Salt hay	1,500	9,0
Ship timber	1,400	21,0
Ship iron and spikes	89	4,5
Total	5,340	64,5
DEPARTING.		
Oak and pine cord wood	12,687	22,5
Salt hay	250	1,5
Cedar rails	447	8,0
Cedar siding and plank	67	1,5
New vessels, two in number	1,200	67,0
Total departing	14,651	100,5
Total arriving and departing	19,991	165,0

There are sixteen sailing vessels and four scows owned here which navigate the creek with considerable regularity, besides some transient vessels.

It is represented at the shipyards that during the last thirty years more than sixty seagoing vessels of 800 to 1,050 gross tons carrying capacity have been built at Dennisville. In one season five vessels were built. Two were built in 1891, the larger one 145 feet in length, 35 feet in width, and 17 feet in depth of hold. These two vessels were sold for $67,000, and the labor on them cost $17,000. These vessels require when launched 7½ feet of water to float them. In the present state of navigation they can only be launched and hauled through the mud to deep water at great expense. The demand is for still larger vessels. Owing to the lack of sufficient depth of water offers of contracts for vessels to be built this year have been declined, and no more vessels of this class can be built here till navigation is improved.

The improvement of this creek does not involve a large expenditure, and it will probably be permanent. It would be of great benefit to the shipbuilding interest and to the local commerce. I am therefore of the opinion that Dennis Creek is worthy of improvement by the General Government. It will cost $250 to survey the creek with the view of submitting plan and estimate for its improvement.

Very respectfully, your obedient servant,

C. W. RAYMOND,
Major, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Though Col. Henry L. Abbot, Corps of Engineers, Division Engineer, Northeast Division.)

[First indorsement.]

NORTHEAST DIVISION, ENGINEER OFFICE,
New York, August 1, 1892.

Respectfully forwarded to the Chief of Engineers, U. S. Army.

I concur with Maj. Raymond in considering Dennis Creek, New Jersey, to be worthy of improvement by the General Government to the extent and for the reasons stated.

HENRY L. ABBOT,
Colonel of Engineers, Bvt. Brig. Gen. U. S. A.,
Engineer, Northeast Division.

G 15.

PRELIMINARY EXAMINATION OF COOPER CREEK, NEW JERSEY.

[Printed in House Ex. Doc. No. 81, Fifty-second Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 5, 1892.

SIR: I have the honor to submit the accompanying copy of report, dated August 13, 1892, by Maj. C. W. Raymond, Corps of Engineers, of the preliminary examination of Cooper Creek, New Jersey, made to comply with provisions of the river and harbor act approved July 13, 1892.

Maj. Raymond states that, in his opinion, Cooper Creek is worthy o improvement by the General Government and submits an estimate o $300 as cost of the survey necessary for preparation of plan for it improvement.

The views of Maj. Raymond are concurred in by the division engineer and by this office.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

Hon. S. B. ELKINS,
Secretary of War.

REPORT OF MAJ. C. W. RAYMOND, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Philadelphia, Pa., August 13, 1892.

GENERAL: In compliance with instructions contained in Department letter dated July 14, 1892, I have the honor to submit the following report upon a preliminary examination of Cooper Creek, New Jersey, in accordance with a provision of the river and harbor act approve July 13, 1892:

This creek rises in the eastern part of Camden County, N. J., pursue a northwesterly course, passing along the northern boundary of the cit of Camden, and enters the Delaware River just above Cooper Point It is navigable for a distance of 9 miles from its mouth for vessel drawing 5 feet of water and for the first 5 miles for vessels of 11½ fee draft. The navigable portion is generally bordered by low groun about a quarter of a mile in width on each side, which is protecte from overflow at high water by earth banks, except where it has bee artificially filled in. Back of this margin of lower land is a broad, fla country but little above high water, which embraces the larger portio of the watershed drained by the creek.

The improvement desired is a channel 70 feet wide and 18 feet dee at mean high water from Browning's Chemical Works to the mouth o the creek, a distance a little less than 1¼ miles, and a channel of th same dimensions through the bar just outside of the mouth, a furthe distance of about 400 feet. * * *

The mean range of tide over this reach is about 6 feet. At Browning's Chemical Works, which are about 1¼ miles from the mouth, freshets raise the water 1 to 4 feet, but seldom more than 2 feet, above tid water. The width of the stream below Browning's averages about 8 feet at low water and about 120 feet between its banks, and carries i its channel a depth of 12 to 15 feet, except a bar between the uppe bridges and one below the mouth, the former carrying a minimu depth of 9½ feet and the latter 13½ feet at mean high water.

There are three bridges over this portion of the creek: a county roa bridge at State street, with a draw of 38 feet; another at Federal street with a draw of 40 feet, and the Camden and Amboy Railroad bridge just below Federal street, with a draw of 40 feet. The drawbridge a Federal street is not now in working order, but proceedings have bee taken to have it repaired.

The pipes of the city waterworks cross the bed of the creek at Stat street at a high-water depth of 12 feet; but it is understood that assurances have been given by the city officials that they will lower th pipes to the desired depth. All the material dredged from the creek can probably be deposited on the adjacent banks without objection from the owners of the land; but in order to cast it over much of it will have to be dredged twice. The material dredged from the outer bar will require boating away in scows.

Of the more important industries concerned in the navigation of the creek, there are nine extensive manufacturing plants, occupying from 2 to 11 acres of space, and employing from 60 to 800 workers each, consisting of 1 woolen mill, 1 nickel works, 4 chemical works, 1 glass works, and 2 iron works.

The following statistics of the commerce of the creek for the calendar year 1891 were furnished by shippers and consignees:

Freight statement.

Articles.	Gross tons.	Value.
ARRIVING.		
Coal	59,642	$178,391
Cord wood	1,600	4,500
Chemicals	4,400	102,000
Bricks	1,300	4,813
Sand	825	425
Stone, building	3,333	4,112
Logwood and other dyewoods	8,486	222,650
Lumber	600	6,000
Pig iron	29,500	444,000
Phosphate rock	9,200	75,000
Manure	30,000	15,000
Sumac	540	30,780
Hay	1,000	8,200
Miscellaneous	4,000	8,000
Total	154,426	1,103,871
DEPARTING.		
Dyewoods	310	8,750
Acids	1,000	50,000
Extracts	134	22,512
Fertilizers	1,000	20,000
Manufactured iron	18,000	540,000
Total	20,444	641,262
Total arriving and departing	174,870	1,745,133

Vessel statement.

Sailing vessels arriving	26
Canal boats and barges:	
Arriving	1,240
Departing	196
Total loaded vessels arriving and departing	1,462

It is claimed that with the proposed improvement of navigation the most economical way of receiving the raw materials at the manufactories and shipping away the manufactured products would be by schooners directly to and from their wharves; but that at present the greater portion comes and goes by rail, owing to the expense of lightering from vessels in the Delaware River on account of lack of sufficient depth in the creek and over the bar at the mouth.

The improvement of the creek channel would probably be permanent. This is inferred from the flatness of the watershed, the moderate freshets, and the general absence of bars.

The permanent maintenance of the cut through the bar at the mouth would probably require occasional dredging or the construction of dikes. The best method of maintaining this part of the channel, and the probable cost of maintenance, can only be determined from a detailed survey.

In my opinion Cooper Creek is worthy of improvement by the General Government. A survey of the creek, with the view of submitting plan and estimate for its improvement, is estimated to cost $300.

Very respectfully, your obedient servant,

C. W. RAYMOND,
Major, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. Henry L. Abbot, Corps of Engineers, Division Engineer, Northeast Division.)

[First indorsement.]

NORTHEAST DIVISION, ENGINEER OFFICE,
New York, August 20, 1892.

Respectfully forwarded to the Chief of Engineers, U. S. Army.

For the reasons herein stated I concur with Major Raymond in considering Cooper Creek worthy of improvement by the General Government; and that the estimated cost of $300 for a survey, with the view of submitting plan and estimate for its improvement, is reasonable.

HENRY L. ABBOT,
Colonel of Engineers, Bvt. Brig. Genl., U. S. A.,
Engineer, Northeast Division.

APPENDIX H.

IMPROVEMENT OF RIVERS AND HARBORS IN DELAWARE, AND IN MARYLAND AND VIRGINIA EAST OF CHESAPEAKE BAY.

REPORT OF WILLIAM F. SMITH, UNITED STATES AGENT, MAJOR OF ENGINEERS, U. S. ARMY, RETIRED, IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1893, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Wilmington Harbor, Delaware.
2. Ice harbor at New Castle, Del.
3. Appoquinimink River, Delaware.
4. Smyrna River, Delaware.
5. Murderkill River, Delaware.
6. Mispillion River, Delaware.
7. Broadkiln River, Delaware.
8. Inland waterway from Chincoteague Bay, Virginia, to Delaware Bay, at or near Lewes, Del.
9. Susquehanna River above and below Havre de Grace, Md.
10. Northeast River, Maryland.
11. Elk River, Maryland.
12. Fairlee Creek, Maryland.
13. Chester River, Maryland, from Crumpton to Jones Landing.
14. Choptank River, Maryland.
15. La Trappe River, Maryland.
16. Warwick River, Maryland.
17. Cambridge Harbor, Maryland.
18. Broad Creek River, Delaware.
19. Wicomico River, Maryland.
20. Manokin River, Maryland.
21. Onancock Harbor, Virginia.
22. Harbor and approaches at Cape Charles City, Va.
23. Removing sunken vessels or craft obstructing or endangering navigation.

EXAMINATIONS.

24. Mouth of St. Jones River, Delaware.
25. Inland waterway between Mispillion and Broadkiln rivers, Delaware.
26. Pocomoke River, Maryland, with view of uniting it with Synepuxent Bay above Snow Hill.
27. Nanticoke River, Delaware.
28. Black Walnut Harbor, Maryland.

UNITED STATES ENGINEER OFFICE,
Wilmington, Del., July 8, 1893.

GENERAL: I have the honor to transmit herewith the annual report for the works of river and harbor improvement in my charge for the fiscal year ending June 30, 1893.

Very respectfully, your obedient servant,

WM. F. SMITH,
United States Agent.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

H I.

IMPROVEMENT OF WILMINGTON HARBOR, DELAWARE.

The river and harbor act of July 13, 1892, appropriated $40,000 for continuing improvement. Proposals for dredging between the Third Street Bridge and the Pulp Works, and for the removal of two ledges of rock, one above and one below Third Street Bridge, were opened November 11, 1892. The lowest bidder was the Atlas Dredging Company, of Wilmington, Del., with whom a contract was made on November 19, 1892, at the price of 13.7 cents per cubic yard for dredging, and $14 per cubic yard for removal of rock, both measured in place. The beginning of operations was delayed by the severe winter and did not take place until March 23, 1893, when the drilling and blasting of the rock above Third Street Bridge were begun. Subsequently, on April 7, dredging was commenced. At the close of the fiscal year the proposed channel in the river had been dredged for a length of 2,015 feet, beginning abreast of Pusey and Jones's shipyard and ending 75 feet east of Market Street Bridge. For a distance of 450 feet the channel approaching the bridge was gradually widened to 200 feet; 60,986 cubic yards of material were removed in this section. Early in the season an examination of the bar at the mouth of the river was made, the channel dredged there four years ago having been reported as rapidly filling up. Its condition was found to be as stated and a project was submitted to the Department on March 30, recommending that the bar be dredged in accordance with the general project, the expense to be paid from the available appropriation. A supplementary contract was made with the Atlas Dredging Company, dated April 24, 1893, under which they agreed to do the dredging at the mouth of the river at the same price and under the same conditions prevailing in the contract covering their work of dredging in the upper river. The contractor suspended dredging in the upper river for the time being, and between June 1 and 12 removed the shoal at the mouth of the river by dredging a channel as agreed upon, 150 feet wide and 15 feet deep at mean low water. The amount of material removed at the bar is 12,000 cubic yards. Dredging in the upper river was subsequently resumed and will be completed during the coming fall. The contractor was granted three months' extension of time for completing contract. At the end of the fiscal year the rock above Third Street Bridge was entirely removed, 467 cubic yards having been taken out, giving a minimum depth of 15 feet at mean low water. Preparations are now in progress for the removal of the rock below the bridge.

The approved project of improvement is for a 15-foot low-water channel 150 feet wide from the mouth of the Christiana River to the Rolling Mill Wharf, which is 4,750 feet above the outer end of the jetty: 100 feet wide from this wharf to the Delaware and Western Railroad Bridge, and 75 feet wide from this bridge to the Pulp Works; also for a channel 12 feet deep and 50 feet wide from the Pulp Works to the Delaware Railroad Bridge, and for the construction of a jetty 1,740 feet long on the north side of the mouth of the river. The Board of Engineers, recommending these improvements in 1881, estimated the total cost at $175,551. The construction of the jetty and dredging operations were begun the following year. A revised estimate for the completion of the project was submitted in 1883. This estimate increased the channel width from the Rolling Mill Wharf to the Pulp Works to 150 feet, and the final cost to $191,384, exclusive of the expense of the jetty, which was then nearly completed, and for the channel above the

Pulp Works, which was stricken off. A modification of the plan of the jetty was made and approved in 1884, providing for an additional height of 4 feet and an extension of 322 feet. The former work was done the following year.

Up to the year 1871 the General Government had at various times expended $32,356 in the improvement of the Christiana River, now Wilmington Harbor. Between the years 1871 and 1881 improvements were carried on under a project for a 12-foot low-water channel from 100 to 200 feet wide. This project was completed in 1881 at a total expense of $83,500.

Under the project adopted in 1881 $215,840.21 has been expended up to the close of the present fiscal year.

The amount asked for, if appropriated, will be expended in completing the project.

Wilmington is a port of entry and in the collection district of Delaware. The amount of revenue collected during the fiscal year ending June 30, 1893, is $14,368.14.

AMOUNTS APPROPRIATED.

By act approved—		By act approved—	
July 14, 1836	$15,000	June 14, 1880	$10,000
March 3, 1837	8,000	March 3, 1881	50,000
July 7, 1838	9,356	By act passed August 2, 1882	50,000
July 11, 1870	15,000	By act approved—	
June 10, 1872	10,000	July 5, 1884	25,000
March 3, 1873	6,000	August 5, 1886	18,750
June 23, 1874	6,000	By act of August 11, 1888	30,000
March 3, 1875	10,000	By act approved—	
August 14, 1876	16,000	September 19, 1890	30,000
June 18, 1878	7,000	July 13, 1892	40,000
March 3, 1879	3,500		

Of the above the sum of $2,411.22 has been carried to the surplus fund of the Treasury.

Money statement.

July 1, 1892, balance unexpended	$2,345.34
Amount appropriated by act approved July 13, 1892	40,000.00
	42,345.34
June 30, 1893, amount expended during fiscal year	14,435.55
July 1, 1893, balance unexpended	27,909.79
July 1, 1893, amount covered by uncompleted contracts	27,909.79
Amount (estimated) required for completion of existing project	47,634.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	47,634.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for dredging and removal of rock in Wilmington Harbor, Delaware, received and opened November 11, 1892, by Gen. William F. Smith, United States Agent.

No.	Name and address of bidder.	Time.		Price per cubic yard, measured in place.	
		Commence.	Complete.	Dredging.	Rock.
				Cents.	
1	Atlas Dredging Co., Wilmington, Del	Nov. 25, 1892	June 30, 1893	.13⅒	$14.00
2	Enoch Townsend, Somers Point, N. J	Nov. 30, 1892	May 1, 1893	....	21.00
3	Frank C. Somers, Camden, N. J	May 15, 1893	Dec. 31, 1893	.15½	....
4	American Dredging Co., Philadelphia, Pa	Dec. 1, 1892	June 30, 1893	14⅒	14.50

Contract with Atlas Dredging Company.

COMMERCIAL STATISTICS.

Number of vessels cleared and entered from July 1, 1892, to March 31, 1893, is 185; gross tonnage, 17,748.47.

Vessels built and repaired at Wilmington, Del., during the year ending June 30, 1893: Built, 25, of aggregate tonnage 16,372; value, $1,965,000. Repaired, 185; value, $185,000.

Full statistics could not be obtained, though an effort was made to secure them. The above were furnished by Harlan & Hollingsworth Company, Jackson and Sharp Company, Pusey & Jones Company, and the collector of customs.

H 2.

ICE HARBOR AT NEW CASTLE, DEL.

There were no operations during the fiscal year ending June 30, 1893, the existing project, as far as it relates to the construction of ice piers, having been completed in 1891.

The ice in the Delaware River was unusually severe during the past winter, and navigation was almost entirely interrupted for about 6 weeks. During that time this harbor was crowded with vessels of the larger class—barks, barkentines, colliers, large tugs, and schooners—which tied up there until the ice went out. When the break-up occurred the run of ice, both during flood and ebb tide, was particularly strong on this side of the river, and the ice piers in the outer portion of the harbor were subjected to a severe test, but successfully withstood the shocks and prevented the large fields of ice from entering the harbor. Pier O, built in 1891, though much smaller than the others, proved to have ample stability, and it was especially noticeable how clean the cutwaters of the iron caisson would break up the floes when the latter struck.

It is proposed to expend the unexpended balance of the appropriation of September 19, 1890, in dredging the shoal portion of the harbor to 18 feet, from the 18-foot contour shoreward as for as the available funds will permit.

The project for the establishment of an ice harbor at New Castle dates back to Colonial times, and was suggested by the necessity of providing a place of refuge for vessels during prevalence of ice in the Delaware River. Since the ice harbor at Reedy Island, 10 miles farther down the river, has become useless from decay and lack of water, this harbor is now the first one vessels reach in coming up the bay. The number of vessels seeking refuge during winter is very great, and the enlargement of the harbor is only a question of time. Attention was called in the last year's report to the practicability of materially enlarging the area of the harbor if an additional pier were constructed on the 30-foot contour at the point of intersection of two lines prolonged over piers K and M, and L and N, respectively.

New Castle is in the collection district of Delaware. Wilmington is the nearest port of entry, and the amount of revenue collected there during the fiscal year ending June 30, 1893, is $14,368.14.

AMOUNTS APPROPRIATED.

By act approved—	
June 14, 1880	$5,000
March 3, 1881	3,000
By act passed August 2, 1882	2,000
By act of August 11, 1888	10,000
By act approved—	
September 19, 1890	5,000
July 13, 1892	3,000

Money statement.

July 1, 1892, balance unexpended	$89.67
Amount appropriated by act approved July 13, 1892	3,000.00
	3,089.67
June 30, 1893, amount expended during fiscal year	40.49
July 1, 1893, balance unexpended	3,049.18
July 1, 1893, amount covered by uncompleted contracts	3,049.18
Amount (estimated) required for completion of existing project	19,365.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	10,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for dredging in Smyrna River, Delaware, received and opened October 3, 1892, by Gen. William F. Smith, United States Agent.

No.	Name and address of bidder.	Time.		Price per cubic yard, place measurement.
		Commence.	Complete.	
				Cents.
1	American Dredging Co., Philadelphia, Pa	Mar. 1, 1893	Apr. 30, 1893	21
2	Frank C. Somers, Camden, N. J	Feb. 1, 1893	May 15, 1893	27
3	Chester T. Caler, Norfolk, Va	May 15, 1894	July 1, 1894	13
4	National Dredging Co. Wilmington, Del	Oct. 15, 1892	Dec. 15, 1892	23½

Contract with Chester T. Caler.

COMMERCIAL STATISTICS.

Receipts and shipments.

Class.	Tons.	Value.
Receipts:		
Bone, coal, iron, phosphate, rock, and ice	6,700	$88,000
Grain, truck, hay, potatoes, live stock, etc	22,901	294,750
Chemicals, canned goods, fertilizers, etc	8,522	207,000
General merchandise	10,000	400,000
Total	48,123	989,750
Shipments:		
Cordwood, railroad ties, and ship timber	73,572	209,000
Baskets, brick, canned goods, crates, etc	120,433	949,000
Fruit, truck, grain, hay, poultry, cattle, etc	23,466	1,077,150
General merchandise	5,000	200,000
Total	222,471	2,435,150
Total receipts and shipments	270,594	3,422,900

Vessels trading in Smyrna River, Delaware.

Class.	No.	Aggregate tonnage.	Draft.	Trips.
			Feet.	
Steamers	4	560	5 to 6	Daily three months and triweekly balance of year.
Tugboats	5		4 5	Charter.
Schooners	4	200	4 5	Do.
Sloops				Irregular.

The above statistics were furnished by Mr. A. E. Jardine, secretary of the Philadelphia and Smyrna Transportation Company.

H 5.

IMPROVEMENT OF MURDERKILL RIVER, DELAWARE.

Murderkill River is a tidal stream and flows through Kent County, Del., in a general northeasterly direction into the Delaware Bay.

The present head of navigation is at the town of Frederica, 9 miles from the mouth of the river; tidal influence, however, extends to a point 6½ miles above that town. The rise and fall of the tide is 3.83 feet at the mouth of the river and 1.08 feet at Frederica. The two lower miles of the river have an average width of 150 feet and an average depth of 7.8 feet. The remaining portion of the river up to Frederica has a uniform average width of 90 feet and an average depth of 6.2 feet in the channel. Since 1820 the bends in the river have at various periods been connected by canals of narrow widths, dug by private parties, to avoid certain hard shoals within the original course of the river and to shorten the distance. The length of the bends thus cut off is 4.2 miles. The mouth of the river is obstructed by a sand bar, nearly dry at low water, which threatens to close the river entirely.

A survey of this river was made in accordance with the requirements of the river and harbor act of September 19, 1890, and the report, with estimates for its improvement, is printed in the Annual Report of the Chief of Engineers for 1892, pp. 981–987. The plan of improvement therein recommended is a channel 80 feet in width and 7 feet in depth at low water from the mouth to Frederica and from the mouth of the river to the 7-foot depth in Delaware Bay a cut 250 feet in width at the top with a width of 150 feet at the bottom, the estimated cost being $47,550.

The project was adopted in 1892, an appropriation of $7,000 being made by Congress for beginning work. A contract dated October 24, 1892, has been made with Chester T. Caler, of Norfolk, Va., for dredging at the mouth of the river at the rate of 13 cents per cubic yard measured in place.

Operations commenced on June 28, 1893, at the inner end of the cut inside the mouth of the river, and at the end of the fiscal year a cut 60 feet wide, 5 feet deep at mean low water, and 220 feet long had been dredged. The number of cubic yards of material removed is 2,350.

The amount asked for will be expended in dredging at the bar.

This work is in the collection district of Delaware. Wilmington is the nearest port of entry, at which the amount of revenue collected during the fiscal year ending June 30, 1893, was $14,368.14.

AMOUNT APPROPRIATED.

By act approved July 13, 1892	$7,000

Money statement.

Amount appropriated by act approved July 13, 1892	$7,000.00
June 30, 1893, amount expended during fiscal year	152.90
July 1, 1893, balance unexpended	6,847.10
July 1, 1893, amount covered by uncompleted contracts	6,847.10
Amount (estimated) required for completion of existing project	40,550.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	10,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

Abstract of proposals for dredging in Murderkill River, Delaware, received and opened October 3, 1892, by Gen. William F. Smith, United States Agent.

No.	Name and address of bidder.	Time.		Price per cubic yard, measured in place.
		Commence.	Complete.	
				Cents.
1	Frank C. Somers, Camden, N. J	June 3, 1893	Oct. 31, 1893	20
2	Chester T. Caler, Norfolk, Va	July 10, 1893	Oct. 10, 1893	13
3	B. G. Bailey, Philadelphia, Pa	Dec. 1, 1892	May 1, 1893	23½
4	American Dredging Co., Philadelphia, Pa	June 1, 1893	July 31, 1893	20

Contract with Chester T. Caler.

Commercial statistics were asked for, but none have been received.

H 6.

IMPROVEMENT OF MISPILLION RIVER, DELAWARE.

Mispillion River is a narrow and tortuous tidal stream about 18 miles long, and flows into the Delaware Bay about 17 miles north of Cape Henlopen. It forms part of the boundary line between Kent and Sussex counties, Del. The river, formerly Mispillion Creek, has been under improvement by the General Government since 1879, the project for a 6-foot low-water channel, 40 feet wide, from Milford, the head of navigation, to the mouth of the river being completed with the exception of the removal of a shoal just inside the mouth. The entrance to the river is obstructed by shoal mud flats projecting nearly 1 mile from the shore. The average rise of the tide at these flats is 4 feet.

A survey of the mouth of this river was made in accordance with the requirements of the river and harbor act of September 19, 1890, and the report, with estimates for its improvement, is printed in the Annual Report of the Chief of Engineers for 1892, pp. 988–993. The plan of improvement therein recommended is a cut across the flats 150 feet in width and 6 feet in depth at mean low water from the mouth of the river to the 6-foot contour in the bay, the dredged material to form a wall of mud on the northern side of the cut, the estimated cost being $24,000.

The project was adopted in 1892, an appropriation of $12,000 being made by Congress for beginning work. A contract was made on October 24, 1892, with Chester T. Caler, of Norfolk, Va., for dredging in accordance with the project, at the rate of 13 cents per cubic yard, measured in place. Operations were begun on May 25, 1893, inside the mouth of the river opposite the light-house, the intention being to dredge the proposed cut from the inner or shore end and to build the bank in going out. After a few days' work it was found to be impossible to keep the dredge afloat, as the dredged material thrown over would continually, under the effect of the strong cross currents, return into the cut. A change of base of the cut, from the shoal to the main shore north of it, had the same result on the occurrence of the first storm, although the indications of the bank being less disturbed were previously more favorable. A report stating the difficulties experienced having been sent to the Department, authority was received on June 21, 1893, to suspend operations temporarily until some protective works could be devised.

At the time dredging was suspended the contractor had, under his contract, removed 6,829 cubic yards of material, although the actual amount was much greater. The cut dredged was 600 feet long, 40 feet wide, and 6 feet deep, and has undoubtedly considerably filled in again.

This work is in the collection district of Delaware. Wilmington is the nearest port of entry, at which the amount of revenue collected during the fiscal year ending June 30, 1892, is $14,368.14.

AMOUNTS APPROPRIATED.

By act approved—	
March 3, 1879	$3,000
June 14, 1880	4,000
March 3, 1881	3,500
By act passed August 2, 1882	3,000
By act of August 11, 1888	3,500
By act approved July 13, 1892	12,000

Money statement.

Amount appropriated by act approved July 13, 1892		$12,000.00
June 30, 1893, amount expended during fiscal year		1,089.38
July 1, 1893, balance unexpended		10,910.62
July 1, 1893, outstanding liabilities	$80.49	
July 1, 1893, amount covered by uncompleted contracts	5,201.00	
		5,281.49
July 1, 1893, balance available		5,629.13
Amount (estimated) required for completion of existing project		12,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895		12,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for dredging in Mispillion River, Delaware, received and opened by Gen. William F. Smith, United States Agent.

No.	Name and address of bidder.	Time.		Price per cubic yard, measured in place.
		Commence.	Complete.	
				Cents.
1	Frank C. Somers, Camden, N. J	Apr. 15, 1893	Oct. 31, 1893	15½
2	Chester T. Caler, Norfolk, Va	Oct. 15, 1894	Dec. 31, 1894	13
3	B. G. Bailey, Philadelphia, Pa	Dec. 1, 1892	May 1, 1893	83½
4	American Dredging Co., Philadelphia	Apr. 1, 1893	July 31, 1893	14

Contract with Chester T. Caler.

Commercial statistics were asked for, but none have been received.

H 7.

IMPROVEMENT OF BROADKILN RIVER, DELAWARE.

There were no operations during the fiscal year ending June 30, 1893, for want of funds. The orignal project for improvement was made in 1871, and is for a 6-foot low-water navigation from the mouth of the river to Milton, the head of navigation, and for a new entrance protected by a jetty, at an estimated cost of $80,447. This project was modified in 1881 relative to the entrance and estimate reduced to $51,450. The channel within the river has been completed in accordance with the project at an expense of $35,000, which was the total amount expended at the close of the fiscal year ending June 30, 1892.

The amount required for the completion of the existing project is for the improvements at the mouth of the river as designed twenty years ago. In view of the projected location, only a few miles below the Broadkiln, of the outlet for the inland waterway from Chincoteague Bay to Delaware Bay, a possibility has lately arisen that the Broadkiln can be connected with the waterway at much less cost and with greater advantage to both than if the existing project were carried out. It is recommended, therefore, for the present not to appropriate any money for a new entrance.

This work is in the collection district of Delaware. Wilmington is the nearest port of entry, at which the amount of revenue collected during the fiscal year ending June 30, 1893, is $14,368.16.

AMOUNTS APPROPRIATED.

By act approved—	
March 3, 1873	$10,000.00
June 14, 1880	5,000.00
March 3. 1881	5,000.00
By act passed August 2, 1882	5,000.00
By act of August 11, 1888	10,000.00

Money statement.

Amount (estimated) required for completion of existing project. Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867.	$21,500.00

H 8.

IMPROVEMENT OF INLAND WATERWAY FROM CHINCOTEAGUE BAY, VIRGINIA, TO DELAWARE BAY, AT OR NEAR LEWES, DELAWARE.

At the close of the fiscal year ending June 30, 1892, the appropriation of $50,000 made by the river and harbor act of September 19, 1890, was still unavailable, as the proviso of the act, that the right of way is to be secured without cost to the United States, had not yet been complied with. Proceedings for the condemnation of the necessary land between Rehoboth Bay and Delaware Bay were pending at the time, and on June 25, 1892, the final awards made by the commissioners of the State of Delaware were tendered to the parties in interest. All of them accepted with the exception of three, who received slightly increased damages under an appeal taken to the court of the State. On September 10, 1892, sundry papers received from the State authorities, together with a map prepared in this office showing the condemned land, were submitted to the Department, and on November 3 following the Attorney-General of the United States informed the Secretary of War that in his opinion a valid title to the right of way for the canal between Rehoboth Bay and Delaware Bay is now vested in the United States. The strip of land, including several supplementary pieces of ground acquired for constructive purposes, which the State of Delaware secured for this section of the inland waterway without cost to the United States, comprises an area of 286 acres, for which in the aggregate $3,216 were paid.

The river and harbor act of July 13, 1892, appropriated $25,000 for continuing improvement and directed that this amount be expended between Delaware Bay and Indian River after the right of way is secured without cost to the United States. A project for the expenditure of this appropriation and the one of $50,000 made September 19, 1890, was submitted to the Department on January 10, 1893, and was approved. The project divides the proposed work into two sections: The first is dredging a 4-foot channel 20 feet wide in the canal and bays situated along the line of the inland waterway between Synepuxent Bay and Rehoboth Bay; the second is to excavate so much of a cut 20 feet wide at the bottom and 6 feet deep at the adopted mean low water as can be made with the available funds from the head of Rehoboth Bay toward Lewes Creek.

Proposals for the work were opened March 2, 1893, and as the lowest bidder recommended for acceptance failed to sign the contract, the work was readvertised. On May 18 proposals were again opened, but they were all considered too high and were rejected, and subsequently authority was received to readvertise for new proposals to be opened July 18, 1893.

The adopted project for improvement is based upon a survey made in 1884. The original report recommended a channel 70 feet wide at bottom and 6 feet in depth, connecting the many inland bays between Chincoteague Bay and Delaware Bay, the outlet within the latter bay to be at or near Lewes, Del., in the vicinity of the Delaware Breakwater Harbor. The length of the proposed waterway is about 75 miles and its cost was estimated at $350,000. The project was modified in 1892, the width of the proposed channel for the section lying between Rehoboth Bay and Delaware Bay having been reduced to 20 feet at the bottom, the depth, 6 feet, remaining as originally proposed.

At the close of the fiscal year ending June 30, 1892, $67,932.87 had been expended, and a cut had been made 20 feet wide and 4 feet deep between Little Assawaman Bay and Whites Creek, a tributary of Indian River Bay. This cut is about 4 miles long and passes across the neck of land dividing these bays.

Three temporary wooden bridges over the cut had also been constructed. The opening of this section of the waterway created in a limited degree a local commerce upon the lower bays carried on by vessels of the smallest class.

The amount asked for, if appropriated, will be expended in continuing the excavation for a cut between Rehoboth Bay and Delaware Bay.

AMOUNTS APPROPRIATED.

By act approved—	
August 5, 1886	$18,750
August 11, 1888	50,000
September 19, 1890	50,000
July 13, 1892	25,000

Money statement.

July 1, 1892, balance unexpended	$50,817.13
Amount appropriated by act approved July 13, 1892	25,000.00
	75,817.13
June 30, 1893, amount expended during fiscal year	1,249.13
July 1, 1893, balance unexpended	74,568.00
Amount (estimated) required for completion of existing project	206,250.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	100,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

COMMERCIAL STATISTICS.

There has been no change in the commerce and navigation since last annual report, which was as follows: Total receipts and shipments, 1,493 tons; value, $17,387; number of vessels using the waterway, 10; aggregate tonnage, 64.

H 9.

IMPROVEMENT OF SUSQUEHANNA RIVER ABOVE AND BELOW HAVRE DE GRACE, MD.

There were no operations during the fiscal year ending June 30, 1893, and the appropriation of $8,000 made by the river and harbor acts of September 19, 1890, and July 13, 1892, are still unexpended. A report upon a survey of this river above Havre de Grace, was submitted December 26, 1891, with estimates for a new project.

During the past winter the ice was unusually heavy in the Susquehanna River and of long duration. During the latter part of January four distinct gorges had formed at the mouth: One across the main channel, opposite Havre de Grace; one at the head of Watson Island; a third on the eastern bank at Mount Ararat, and the fourth at Port Deposit. Above this town the ice was piled 30 feet above the ordinary level of the river and, in consequence, all the islands above were submerged, notwithstanding the fact that the stage of water was very low. The gorges disappeared gradually during February without doing much damage.

The original project for improvement above and below Havre de Grace includes the making of a 15-foot low-water channel below the town and the removal of the shoal on the west side of the channel opposite Watson Island to a depth of 8 feet below mean low water. The channel below the town was dredged to a depth of 12 feet in 1885. The recent survey showed that it had partially shoaled again. The removal of the eastern bank of the shoal opposite Watson Island has been in progress since 1883, and is done to prevent, in a measure, the formation of ice gorges at or near the town of Port Deposit, situated 2¼ miles above the island. About $32,000 have been expended in dredging this shoal, resulting in some temporary relief, but the recent survey shows that the area dredged has resumed nearly its original state since work has been discontinued.

Susquehanna River is in the collection district of Baltimore, which is the nearest port of entry. The amount of revenue collected there during the fiscal year ending June 30, 1893, is $4,629,199.13.

AMOUNTS APPROPRIATED.

By act approved—	
August 30, 1852	$10,000
June 23, 1866	26,400
July 11, 1870	12,000
June 14, 1880	28,000
March 3, 1881	15,000
By act passed August 2, 1882	25,000
By act approved—	
July 5, 1884	20,000
August 5, 1886	6,000
By act of August 11, 1888	10,000
By act approved—	
September 19, 1890	4,000
July 13, 1892	4,000

Money statement.

July 1, 1892, balance unexpended	$4,094.69
Amount appropriated by act approved July 13, 1892	4,000.00
	8,094.69
June 30, 1893, amount expended during fiscal year	56.32
July 1, 1893, balance unexpended	8,038.37
Amount (estimated) required for annual dredging	20,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	20,000.00

Submitted in compliance with requirements of section 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

COMMERCIAL STATISTICS.

Receipts and shipments for year ending December 31, 1892.

Class.	Tons.	Value.
Coal and ice	467,162	$1,335,924
Lumber, shingles, and timber	15,575	119,175
Stone, sand, and ground flint	12,400	47,000
Fertilizers	6,000	120,000
Hay and grain	1,274	27,100
Canned goods, fish, barrels, etc	6,435	147,400
General merchandise	32,738	422,875
Total	541,584	2,219,474

The above statistics were furnished by Messrs. McClenahan and Bro., and includes the commerce at Havre de Grace, Perryville, Port Deposit, Frenchtown, Lapidum, and Conowingo.

H 10.

IMPROVEMENT OF NORTHEAST RIVER, MARYLAND.

An appropriation of $2,640 was made by the river and harbor act of July 13, 1892, for completing improvement. Proposals for dredging were opened on October 7, 1892. The lowest bid was received from the American Dredging Company, of Philadelphia, with whom a contract was made on October 18, 1892, at the price of 11½ cents per cubic yard, scow measurement.

Work was begun on April 13, 1893, and the contract completed on May 2, following. The number of cubic yards of material removed under the contract was 19,954. The length of the channel dredged to a width of 75 feet from outside and across the bar was 5,780 feet, and as the cut, which had been dredged in 1891 to a width of 40 feet had, with the exception of about 600 feet, completely filled up again, it became necessary to redredge the same, which the available funds fortunately permitted. The channel inside the bar was dredged at several points, where it was too narrow, to 60 feet in width as far as Davis Wharf. This completed the project.

The approved project adopted in 1890 and just completed, was for a channel 6 feet deep at mean low water 75 feet wide across the bar and 60 feet wide in the river proper up to Davis Wharf, at an estimated cost of $5,140.

Nothing further is recommended.

This work is in the collection district of Baltimore, which is the nearest port of entry. The amount of revenue collected there during the fiscal year ending June 30, 1893, is $4,629,199.13.

AMOUNTS APPROPRIATED.

By act approved—

June 10, 1872	$10,000
June 14, 1880	5,500
September 19, 1890	2,500
July 13, 1892	2,640

Money statement.

July 1, 1892, balance unexpended	$61.63
Amount appropriated by act approved July 13, 1892	2,640.00
	2,701.63
June 30, 1893, amount expended during fiscal year	2,701.63

Abstract of proposals for dredging in Northeast River, Maryland, received and opened October 27, 1892, by Gen. William F. Smith, United States Agent.

No.	Name and address of bidder.	Time.		Price per cubic yard measured in scows.
		Commence.	Complete.	
				Cents.
1	Frank C. Somers, Camden, N. J.	Oct. 1, 1893	Dec. 31, 1893	18
2	American Dredging Co., Philadelphia, Pa.	Nov. 1, 1892	Dec. 15, 1892	11⅛
3	Atlas Dredging Co., Wilmington, Del.	Sept. 1, 1893	Dec. 31, 1893	12
4	Chester T. Caler, Norfolk, Va.	Sept. 3, 1893	Oct. 10, 1893	11⅓
5	Baltimore Dredging Co., Baltimore, Md.	Sept. 1, 1893	In 30 days	12¼

Contract with American Dredging Company.

H II.

IMPROVEMENT OF ELK RIVER, MARYLAND.

An appropriation of $5,000 was made by the river and harbor act of July 13, 1892, for continuing improvement. Proposals for dredging were opened on October 7, 1892. The lowest bidder was Chester T. Caler, of Norfolk, Va., with whom a contract was made on October 26, 1892, at the price of 9.9 cents per cubic yard, measured in place. Operations were begun on May 6, 1893, and were completed on June 30, 1893, following, 45,255 cubic yards of material having been removed. The low price for which the work was done not only allowed the improving of the river from Morgan Gut to the clubhouse, which completed the project, but in addition, all that portion of the river dredged in 1891 from the county bridge to Morgan Gut was dredged again, as about 1 foot of shoaling had taken place since that time. The channel at the wharves particularly had shoaled more than that farther down the river, and by the terms of the contract the material excavated there, 5,377 cubic yards, had to be taken away in scows, whereas that in the other portion of the channel was deposited upon the banks of the river.

The approved project for improvement is based upon a survey of the river made in 1889, and provides for an 8-foot channel at low water from the bridge at Scott's Wharf to deep water below Cedar Point. The width of the channel is to be 100 feet except at the wharves, where it is increased to the existing width between the wharf lines. The estimated cost is $24,000. At the close of the fiscal year ending June 30, 1892, $8,904.23 had been expended and about 3,800 feet of the proposed channel had been completed, beginning at the bridge. During the past fiscal year the remaining length of the channel, 5,500 feet, was dredged. At the close of the fiscal year there existed a clear channel 100 feet wide and 8½ feet deep from the bridge to Cedar Point, a distance of 2 miles, covering the whole extent of the present project which therefore can be reported as completed.

Nothing further is recommended.

Elk River is in the collection district of Baltimore, which is the nearest port of entry. The amount of revenue collected there during the fiscal year ending June 30, 1893, is $4,629,199.13.

AMOUNTS APPROPRIATED.

By act approved—	
June 23, 1874	$5,000
March 3, 1875	5,000
June 14, 1880	10,000
March 3, 1881	5,000
By act passed August 2, 1882	6,500
By act approved—	
September 19, 1890	10,000
July 13, 1892	5,000

Money statement.

July 1, 1892, balance unexpended	$1,095.77
Amount appropriated by act approved July 13, 1892	5,000.00
	6,095.77
June 30, 1893, amount expended during fiscal year	2,599.83
July 1, 1893, balance unexpended	3,495.94
July 1, 1893, outstanding liabilities	2,980.48
July 1, 1893, balance available	515.46

Abstract of proposals for dredging in Elk River, Maryland, received and opened October 7, 1892, by Gen. William F. Smith, United States Agent.

No.	Name and address of bidder.	Time.		Price per cubic yard measured in place.*
		Commence.	Complete.	
				Cents.
1	Frank C. Somers, Camden, N. J	July 1, 1893	Nov. 30, 1893	16
2	Fred. L. Somers, Philadelphia, Pa	...do	Nov. 1, 1893	11
3	American Dredging Co., Philadelphia, Pa	Dec. 15, 1892	Feb. 15, 1893	$10\frac{8}{10}$
4	Atlas Dredging Co., Wilmington, Del	Dec. 1, 1893	June 30, 1894	12
5	Chester T. Caler, Norfolk, Va	May 25, 1893	Aug. 30, 1893	$9\frac{8}{10}$
6	Baltimore Dredging Co., Baltimore, Md	Aug. 15, 1893	60 working days.	$12\frac{1}{4}$

Contract with Chester T. Caler.

COMMERCIAL STATISTICS.

Receipts and shipments.

Class.	Tons.	Value.
Receipt:		
Bone, bone ash, coal, cordwood, etc	13,072	$72,498
Sulphuric acid and potash salts	950	8,750
Total	3,426	81,248
Shipments:		
Fertilizers	2,000	50,000
Grain and hay	1,426	32,326
Total	3,426	82,326
Total receipts and shipments	17,448	163,574

Vessels trading in Elk River, Maryland.

Class.	No.	Aggregate tonnage.	Draft.	Trips.
			Feet.	
Steamers	1	27	5	Pleasure yacht.
Tugboats	3	124	$6\frac{1}{2}$ to $7\frac{1}{2}$	Whenever required.
Schooners	81	3,000	3 to $7\frac{1}{2}$	By charter.
Sloops	2	63	5	Do.

Vessels built in Elk River, Maryland.

Class.	No.	Actual tonnage.	Draft when leaving yard.	Calculated maximum draft.
			Feet.	*Feet.*
Barges (wooden)	18	800	$2\frac{1}{2}$	$9\frac{1}{2}$

The above statistics were furnished by William H. Mackall, of the Scott Fertilizer Company, Elkton, Md., and was accompanied by the following letter:

ELKTON, MD., *June 14, 1893.*

DEAR SIR: I inclose the report of the commerce of Elk River for the year ending May 31. It is as full as I have the data to make it. I think there has been somewhat more trade by water than appears in this report, but I have no means of finding exactly how much.

The trade of the upper part of this river is confined chiefly to the Singerly Pulp and Paper Company and the Scott Fertilizer Company. They could not carry on their business without water facilities.

The Singerly Company employ at their two mills something over 300 men. The Scott Company about 40 in their busy season, the late summer; not so many during the remainder of the year.

Before the Government made the improvement (in 1873, I think) the Singerly pulp and paper mill was not even thought of, and the original firm of the Scott Brothers was doing a small business by rail, so, you see, the "commercial statistics" do not fully show the benefits derived from these appropriations. There has also been established a few years ago a yard for building large barges, where they employ from 75 to 100 men. The population of our town has increased largely, and also the value of property and the general business of the community.

I trust you may be able to make a favorable report to the Department upon the general beneficial results of the work.

Yours, truly,

WM. H. MACKALL.

Gen. WILLIAM F. SMITH.

H 12.

IMPROVEMENT OF FAIRLEE CREEK, MARYLAND.

There were no operations during the fiscal year ending June 30, 1893, no appropriation having been made by Congress in the river and harbor bill approved July 13, 1892.

The project adopted in 1888 embraces the dredging of a channel 100 feet wide and 7 feet deep at mean low water across the bar at the mouth and up the creek for a distance of about 2¾ miles; also the dredging of a turning basin at the upper end of the proposed channel if a certain wharf should be built there before the channel is completed. The total estimated cost of the improvement is $15,558. The above wharf has not yet been built, and no appreciable increase in the commerce of the creek, which has always been very limited, has been noted since improvements were begun.

The amount asked for, if appropriated, will be expended in completing the channel inside the creek.

Fairlee Creek is in the collection district of Baltimore, which is the nearest port of entry. The amount of revenue collected there during the fiscal year ending June 30, 1893, is $4,629,199.13.

AMOUNTS APPROPRIATED.

By acts of—	
August 11, 1888	$5,000
September 19, 1890	5,000

Money statement.

July 1, 1892, balance unexpended	$22.47
June 30, 1893, amount expended during fiscal year	22.47
Amount (estimated) required for completion of existing project	5,558.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	5,558.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

head of the river are situated two extensive wharves, owned by the Choptank Steamboat Company and the Maryland Steamboat Company, respectively. The average rise of tide is 1.7 feet.

This river has previously been under improvement by the General Government, $6,000 having been expended between the years 1879 and 1881 in dredging a channel 75 feet wide and 7 feet deep at low water from the mouth to Secretary Landing, at the head of the river. Previously, in 1877, private parties had expended about $6,000 in straightening and deepening the channel.

A survey of this river was made in accordance with the requirements of the river and harbor act of September 19, 1890, and the report, with estimates for its improvement, is printed in the Annual Report of the Chief of Engineers for 1891, pp. 1218–1221. The plan of improvement therein proposed is the dredging of a channel 100 feet wide and 10 feet deep at mean low water from the 10-foot depth in the Choptank River to the wharves at Secretary Landing, at an estimated cost of $18,600.

The project was adopted in 1892, an appropriation of $6,000 being made by Congress for beginning work. Proposals for dredging were opened October 7, 1892. The lowest bidder was Chester T. Caler, of Norfolk, Va., with whom a contract was made on October 26, 1892, at the price of 10 cents per cubic yard, measured in scows. Operations were begun on December 8, 1892, and were much delayed by the following severe winter. The contract was completed on March 28, 1893, 53,811 cubic yards of sand and mud having been removed. Beginning in the Choptank River, 4,400 feet of the approved channel were completed, the width having been increased at one sharp turn to 150 feet. Upon request of one of the steamboat companies, a certain portion of the proposed turning basin at the wharves was also dredged to a depth of 10 feet to give more room for the large steamers landing there. The work done has removed some of the most serious obstacles that prevented the steamers from entering the river during low tides and high winds.

It is proposed to expend the amount asked for, if appropriated, in dredging the remaining length of the approved channel.

Warwick River is in the collection district of Baltimore, which is the nearest port of entry. The amount of revenue collected there during the fiscal year ending June 30, 1893, is $4,629,199.13.

AMOUNT APPROPRIATED.

By act approved July 13, 1892	$6,000

Money statement.

Amount appropriated by act approved July 13, 1892	$6,000.00
July 30, 1893, amount expended during fiscal year	5,991.23
July 1, 1893, balance unexpended	8.77
Amount (estimated) required for completion of existing project	12,600.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	6,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

Abstract of proposals for dredging in Chester River, Maryland, received and opene October 17, 1892, by Gen. William F. Smith, United States Agent.

No.	Name and address of bidder.	Time.		Price per cubi yard measure in plac
		Commence.	Complete.	
				Cents.
1	American Dredging Co., Philadelphia	July 1, 1893	July 31, 1893	1
2	Atlas Dredging Co., Wilmington, Del	Mar. 1, 1894	June 30, 1894	1
3	Baltimore Dredging Co., Baltimore, Md	July 20, 1893	In 40 working days.	1

Contract with American Dredging Company.

COMMERCIAL STATISTICS.

Receipts and shipments.

Class.	Tons.	Value.
Receipts:		
Fertilizers	497	$19, 8
General merchandise	343	17, 1
Total	840	37, 03
Shipments:		
Grain	2, 678	66. 9
General merchandise	292	14. 6
Total	2, 970	81, 53
Total receipts and shipments	3, 810	118, 56

Vessels trading in Chester River, Maryland.

Class.	No.	Aggregate tonnage.	Draft.	Trips.
			Feet.	
Steamers	1	369	7½	Three times a week for about six months.

The above statistics were furnished by Mr. George Warfield, president of th Chester River Steamboat Company, and accompanied by the following letter:

LETTER OF MR. GEORGE WARFIELD.

BALTIMORE, *June 15, 1893.*

DEAR SIR: * * * No new lines have been established. This company ha acquired since the beginning of the Governmental work property to the amount o above $20,000 at Crumpton and beyond, and just as soon as the work is complete sufficiently will send steamer to Kirby Landing and beyond.

We estimate that the result of steamboat navigation regularly to Crumpton an beyond will be a saving in freight rates of about 20 per cent on farm products, an probably 25 per cent general merchandise. The saving of expense to the travelin public will be very great, the steamboat fare being much less than half of what i charged to go Baltimore from Millington, and this difference increasing from point south and east of Millington. Of course the steamboat accommodations do no obtain throughout the year, but as soon as the contemplated improvements are completed steamboat facilities will be given regularly.

Yours, truly,

GEO. WARFIELD,
President.

Gen. WILLIAM F. SMITH.

H 14.

IMPROVEMENT OF CHOPTANK RIVER, MARYLAND.

At the beginning of the past fiscal year a contract had been made for the expenditure, in dredging, of the appropriation of $7,500 made by the river and harbor act of September 19, 1890. Operations were begun on July 16, 1892, and were completed on October 8, 1892, 42,021 cubic yards of material having been removed under the contract. Except for a distance 275 feet, where the width and depth of the channel were sufficient, the channel previously dredged was widened to the approved width of 75 feet and deepened to 7½ feet at mean low water from the wharf at Greensboro to a point 8,765 feet below.

The river and harbor act of July 13, 1892, appropriated $3,000 for continuing improvement. Proposals for dredging were opened October 7, 1892, and the lowest bidder was Chester T. Caler, of Norfolk, Va., with whom a contract was made on October 15, 1892, at the price of 10 cents per cubic yard, measured in place. Work was begun on October 15, and the contract completed December 8, 1892. The number of cubic yards of material removed under this contract was 28,517. The work was done at several shoals between a point 1,405 feet below Doutys Landing and a point 2,000 feet below the Brick Mills, a distance of 12,400 feet. The actual length of channel cut was 6,365 feet, and the depth made throughout was 7½ feet at mean low water.

There now exists a channel not less than 75 feet wide and 7½ feet deep between Greensboro and the Brick Mills, a distance of about 4 miles. The remaining 4 miles, to Denton, have partly been improved by dredging the channel, where needed, to a depth of 5 and 6 feet and widening it to about 40 feet. This section remains, therefore, to be dredged to the proposed width and depth, 75 feet and 8 feet, respectively.

The object of this improvement, which has been carried on since 1881, is to make an 8-foot low-water navigation between the towns of Denton and Greensboro, the width of the channel to be 75 feet. The estimated cost of the improvement is $79,000. At the close of the fiscal year ending June 30, 1892, $37,795.28 had been expended in making the channel throughout between 5 and 8 feet deep and from 30 to 40 feet wide. Shortly after the main obstructions had been removed, in 1887, steamboat navigation with Baltimore was established, and since that time commerce has steadily increased.

It is proposed to expend the amount asked for, if appropriated, in dredging the existing channel to the full depth and width, in accordance with the original project.

This work is in the collection district of Baltimore, which is the nearest port of entry. The amount of revenue collected there during the fiscal year ending June 30, 1893, is $4,629,189.13.

AMOUNTS APPROPRIATED.

By act approved—	
June 14, 1880	$5,000
March 3, 1881	5,000
By act passed August 2, 1882	5,000
By act approved—	
July 5, 1884	5,000
August 5, 1886	10,000
of August 11, 1888	7,500
approved—	
September 19, 1890	7,500
J[illegible]	3,000
[illegible]	

Money statement.

July 1, 1892, balance unexpended	$7,204.7
Amount appropriated by act approved July 13, 1892	3,000.0
	10,204.7
June 30, 1893, amount expended during fiscal year	10,204.7
Amount (estimated) required for completion of existing project	20,000.0
Amount that can be profitably expended in fiscal year ending June 30, 1895	10,000.0

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for dredging in Choptank River, Maryland, received and opened October 7, 1892, by Gen. William F. Smith, United States Agent.

No.	Name and address of bidder.	Time.		Price pe cubic yard, measured in place.
		Commence.	Complete.	
				Cents.
1	Fred. L. Somers, Philadelphia, Pa	Apr. 1, 1893	July 1, 1893	12
2	American Dredging Co., Philadelphia, Pa	Feb. 16, 1893	Mar. 31, 1893	13
3	Chester T. Caler, Norfolk, Va		Dec. 1, 1892	10
4	Baltimore Dredging Co., Baltimore, Md	July 1, 1893	In 40 working days.	11

Contract with Chester T. Caler.

COMMERCIAL STATISTICS.

Receipts and shipments.

Class.	Tons.	Value.
Receipts:		
Fertilizers, lumber, and shingles	2,013	$30,775
General merchandise	150	6,00
Total	2,163	36,775
Shipments:		
Coal and railroad ties	163	5,10
Bricks and canned goods	12,741	64,03
Grain	1,329	28,53
General merchandise	100	4,00
Total	14,333	101,66
Grand total	16,496	138,44

Vessel trading to Greensboro, Md.

Class.	No.	Aggregate tonnage.	Trips.
Steamer	1	175	Weekly.

The above statistics were furnished by Capt. D. S. Brockway, Greensboro, Md.

H 15.

IMPROVEMENT OF LA TRAPPE RIVER, MARYLAND.

La Trappe River, formerly named Dividing Creek, is in the lower section of Talbot County, Eastern Shore of Maryland, and is a small tidal tributary of the Choptank River about 3 miles long. The channel within the river proper is fairly straight, and has a least depth of 8 feet at mean low water; the channel at the mouth, however, is seriously obstructed by two interlocking bars, which make navigation in stormy days and during low tides very difficult. The average rise of the tide is 1.5 feet.

During the years 1884 and 1889 the citizens of the adjoining country interested in the commerce of the river expended a total of $5,333.50 in the improvement of the mouth and at Trappe Landing, which is situated at the head of the river.

A survey of this river was made in accordance with the requirements of the river and harbor act of September 19, 1890, and the report, with estimates for its improvement, is printed in the Annual Report of the Chief of Engineers for 1891, pp. 1215–1218. The plan of improvement therein proposed is for a channel 150 feet wide and 11 feet deep at mean low water across the bar at the mouth, and to dredge the existing channel inside the river where needed to a width of 75 feet and to a depth of 8 feet at mean low water from the mouth to Trappe Landing. The estimated cost of the improvement is $7,250.

The project was adopted in 1892, an appropriation of $2,500 being made by Congress for beginning work. Proposals for dredging at the mouth of the river were opened October 7, 1892, and the lowest bidder was Chester T. Caler, of Norfolk, Va., with whom a contract was made on October 27, 1892, at the price of 10 cents per cubic yard, measured in scows. Operations were begun on April 6, 1893, and were completed on the 28th of the same month, 20,000 cubic yards of material, consisting of sand, mud, and marl having been removed. The result was a channel across the bar at the mouth 100 feet wide and 11 feet deep at mean low water much straighter than the old channel, which was very tortuous.

It is proposed to expend the amount asked for, if appropriated, in completing the project.

La Trappe River is in the collection district of Baltimore, which is the nearest port of entry. The amount of revenue collected there during the fiscal year ending June 30, 1893, is $4,629,199.13.

AMOUNT APPROPRIATED.

By act approved July 13, 1892	$2,500

Money statement.

Amount appropriated by act approved July 13, 1892	$2,500.00
June 30, 1893, amount expended during fiscal year	2,496.30
July 1, 1893, balance unexpended	3.70
Amount (estimated) required for completion of existing project	4,750.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	4,750.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

Money statement.

July 1, 1892, balance unexpended	$7,204.
Amount appropriated by act approved July 13, 1892	3,000
	10,204
June 30, 1893, amount expended during fiscal year	10,204
Amount (estimated) required for completion of existing project	20,000
Amount that can be profitably expended in fiscal year ending June 30, 1895	10,000

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for dredging in Choptank River, Maryland, received and op October 7, 1892, by Gen. William F. Smith, United States Agent.

No.	Name and address of bidder.	Time.		Pric cu ya mea in p
		Commence.	Complete.	
				Ce
1	Fred. L. Somers, Philadelphia, Pa	Apr. 1, 1893	July 1, 1893	
2	American Dredging Co., Philadelphia, Pa	Feb. 16, 1893	Mar. 31, 1893	
3	Chester T. Caler, Norfolk, Va		Dec. 1, 1892	
4	Baltimore Dredging Co., Baltimore, Md	July 1, 1893	In 40 working days.	

Contract with Chester T. Caler.

COMMERCIAL STATISTICS.

Receipts and shipments.

Class.	Tons.	V
Receipts:		
Fertilizers, lumber, and shingles	2,013	
General merchandise	150	
Total	2,163	
Shipments:		
Coal and railroad ties	163	
Bricks and canned goods	12,741	
Grain	1,329	
General merchandise	100	
Total	14,333	
Grand total	16,496	

Vessel trading to Greensboro, Md.

Class.	No.	Aggregate tonnage.	
Steamer	1	175	W

The above statistics were furnished by Capt. D. S. Brockway, Greensboro,

H 15.

IMPROVEMENT OF LA TRAPPE RIVER, MARYLAND.

La Trappe River, formerly named Dividing Creek, is in the lower section of Talbot County, Eastern Shore of Maryland, and is a small tidal tributary of the Choptank River about 3 miles long. The channel within the river proper is fairly straight, and has a least depth of 8 feet at mean low water; the channel at the mouth, however, is seriously obstructed by two interlocking bars, which make navigation in stormy days and during low tides very difficult. The average rise of the tide is 1.5 feet.

During the years 1884 and 1889 the citizens of the adjoining country interested in the commerce of the river expended a total of $5,333.50 in the improvement of the mouth and at Trappe Landing, which is situated at the head of the river.

A survey of this river was made in accordance with the requirements of the river and harbor act of September 19, 1890, and the report, with estimates for its improvement, is printed in the Annual Report of the Chief of Engineers for 1891, pp. 1215–1218. The plan of improvement therein proposed is for a channel 150 feet wide and 11 feet deep at mean low water across the bar at the mouth, and to dredge the existing channel inside the river where needed to a width of 75 feet and to a depth of 8 feet at mean low water from the mouth to Trappe Landing. The estimated cost of the improvement is $7,250.

The project was adopted in 1892, an appropriation of $2,500 being made by Congress for beginning work. Proposals for dredging at the mouth of the river were opened October 7, 1892, and the lowest bidder was Chester T. Caler, of Norfolk, Va., with whom a contract was made on October 27, 1892, at the price of 10 cents per cubic yard, measured in scows. Operations were begun on April 6, 1893, and were completed on the 28th of the same month, 20,000 cubic yards of material, consisting of sand, mud, and marl having been removed. The result was a channel across the bar at the mouth 100 feet wide and 11 feet deep at mean low water much straighter than the old channel, which was very tortuous.

It is proposed to expend the amount asked for, if appropriated, in completing the project.

La Trappe River is in the collection district of Baltimore, which is the nearest port of entry. The amount of revenue collected there during the fiscal year ending June 30, 1893, is $4,629,199.13.

AMOUNT APPROPRIATED.

By act approved July 13, 1892	$2,500

Money statement.

Amount appropriated by act approved July 13, 1892	$2,500.00
June 30, 1893, amount expended during fiscal year	2,496.30
July 1, 1893, balance unexpended	3.70
Amount (estimated) required for completion of existing project	4,750.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	4,750.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

Abstract of proposals for dredging in Latrappe River, Maryland, received and opened October 7, 1892, by Gen. William F. Smith, United States Agent.

No.	Name and address of bidder.	Time.		Price per cubic yard, measured in place.
		Commence.	Complete.	
				Cents.
1	Fred L. Somers, Philadelphia, Pa	Feb. 1, 1893	Mar. 30, 1893	13
2	American Dredging Co., Philadelphia, Pa	Apr. 1, 1893	Apr. 30, 1893	14
3	Atlas Dredging Co., Wilmington, Del	June 1, 1893	June 30, 1893	16
4	Chester T. Caler, Norfolk, Va	Apr. 5, 1893	May 13, 1893	10
5	Baltimore Dredging Co., Baltimore, Md	June 15, 1893	40 working days.	12½

Contract with Chester T. Caler.

COMMERCIAL STATISTICS.

Receipts and shipments.

Class.	Tons.	Value.
Receipts:		
Cord wood, coal, hides, railroad ties, and ice	2,850	$13,900
Bricks, fertilizers, flour, furniture, etc	5,774	67,500
Butter, cattle, eggs, grain, hay, etc	6,727	202,200
General merchandise	4,000	160,000
Total	19,351	443,600
Shipments:		
Coal, cord wood, and building sand	3,600	8,750
Bricks, carriages, fertilizers, lumber, etc	4,738	60,000
Butter, cattle, eggs, grain, poultry, etc	7,405	225,100
General merchandise	4,000	160,000
Total	19,743	453,850
Total receipts and shipments	39,094	897,450

Vessels trading in Latrappe River, Maryland.

Class.	No.	Aggregate tonnage.	Draft.	Trips.
			Feet.	
Steamers	2	600	10	Daily.
Schooners	4	320	7	Charter.
Sloops	100	1,300	5	Oyster boats.

The above statistics were furnished by Capt. C. C. Wheeler, Wheeler's Line Steamers, Maryland.

H 16.

IMPROVEMENT OF WARWICK RIVER, MARYLAND.

Warwick River, formerly Secretary Creek, is a small tidal tributary of the Choptank River in Dorchester County, Eastern Shore of Maryland, and is about 2 miles long. The width at the entrance is about 1,000 feet, within the river it varies between 200 and 600 feet. At the head of the river are situated two extensive wharves, owned by the Choptank Steamboat Company and the Maryland Steamboat Company, respectively. The average rise of tide is 1.7 feet.

This river has previously been under improvement by the General Government, $6,000 having been expended between the years 1879 and 1881 in dredging a channel 75 feet wide and 7 feet deep at low water from the mouth to Secretary Landing, at the head of the river. Previously, in 1877, private parties had expended about $6,000 in straightening and deepening the channel.

A survey of this river was made in accordance with the requirements of the river and harbor act of September 19, 1890, and the report, with estimates for its improvement, is printed in the Annual Report of the Chief of Engineers for 1891, pp. 1218–1221. The plan of improvement therein proposed is the dredging of a channel 100 feet wide and 10 feet deep at mean low water from the 10-foot depth in the Choptank River to the wharves at Secretary Landing, at an estimated cost of $18,600.

The project was adopted in 1892, an appropriation of $6,000 being made by Congress for beginning work. Proposals for dredging were opened October 7, 1892. The lowest bidder was Chester T. Caler, of Norfolk, Va., with whom a contract was made on October 26, 1892, at the price of 10 cents per cubic yard, measured in scows. Operations were begun on December 8, 1892, and were much delayed by the following severe winter. The contract was completed on March 28, 1893, 53,811 cubic yards of sand and mud having been removed. Beginning in the Choptank River, 4,400 feet of the approved channel were completed, the width having been increased at one sharp turn to 150 feet. Upon request of one of the steamboat companies, a certain portion of the proposed turning basin at the wharves was also dredged to a depth of 10 feet to give more room for the large steamers landing there. The work done has removed some of the most serious obstacles that prevented the steamers from entering the river during low tides and high winds.

It is proposed to expend the amount asked for, if appropriated, in dredging the remaining length of the approved channel.

Warwick River is in the collection district of Baltimore, which is the nearest port of entry. The amount of revenue collected there during the fiscal year ending June 30, 1893, is $4,629,199.13.

AMOUNT APPROPRIATED.

By act approved July 13, 1892	$6,000

Money statement.

Amount appropriated by act approved July 13, 1892	$6,000.00
July 30, 1893, amount expended during fiscal year	5,991.23
July 1, 1893, balance unexpended	8.77
Amount (estimated) required for completion of existing project	12,600.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	6,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for dredging in Warwick River, Maryland, received and opened October 7, 1892, by Gen. William F. Smith, United States Agent.

No.	Name and address of bidder.	Time.		Price per cubic yard measured in place.
		Commence.	Complete.	
				Cents.
1	Fred L. Somers, Philadelphia, Pa	Oct. 25, 1892	Jan. 31, 1893	10½
2	American Dredging Co., Philadelphia, Pa	May 1, 1893	June 30, 1893	12
3	Atlas Dredging Co., Wilmington, Del	June 1, 1893	Sept. 1, 1893	10
4	Chester T. Caler, Norfolk, Va	June 10, 1893	Apr. 1, 1894	10
5	Baltimore Dredging Co., Baltimore	June 15, 1893	In 60 working days.	10

Contract with Chester T. Caler.

Commercial statistics were asked for, but none have been received.

H 17.

IMPROVEMENT OF HARBOR AT CAMBRIDGE, MD.

The river and harbor act of July 13, 1892, appropriated $7,737 for completing this improvement, with the proviso that no part of the said sum shall be expended above the bridge until the draw in the said bridge shall have been widened sufficiently to accommodate the commerce of the river. The widening of the draw of the bridge had been determined upon by the Department when the question of the expenditure of $5,000, appropriated September 19, 1890, was under consideration. This appropriation, together with the one of July 13, 1892, was held in reserve until the draw should have been widened to 60 feet. As the commissioners of Dorchester County, in which Cambridge is situated, have for certain reasons, after a lapse of three years, not been able to make the required alteration in the bridge, it was recommended to the Department, in a project submitted March 1, 1893, to proceed with the improvement and to expend so much of the available funds as may be needed in dredging the harbor below the bridge in accordance with the approved project. This project was approved. Proposals were opened on May 11, 1893. The lowest bidder was the American Dredging Company of Philadelphia, with whom a contract was made at the price of 9.4 cents per cubic yard, measured in scows.

Operations commenced on May 24, and at the end of the fiscal year were still in progress, 42,744 cubic yards of material having been removed. The channel from the Choptank River to the railroad wharf, 150 feet wide and 12 feet deep at low water, was completed, and about 35,200 square feet of the area of the inner harbor below the bridge was dredged to a depth of 10 feet at low water. The contract will be finished within a few weeks.

The approved project for improvement is based upon a survey made in 1887. It provides for a channel 150 feet wide and 12 feet deep at low water from that depth in Choptank River to the railroad wharf;

for dredging a certain irregular area inside the harbor below the bridge to a depth of 10 feet, and a channel 150 feet wide and 8 feet deep above the bridge, the estimated cost being $17,736.60.

At the close of the fiscal year ending June 30, 1892, $4,927.44 had been expended in the execution of this project, the 12-foot channel at the entrance to the harbor had been dredged for a width of 88 feet as far as the Maryland Steamboat Company's wharf, and from thence to the railroad wharf one cut, 22 feet wide, had been made.

The balance available when the contract now in force has been completed will suffice to carry out the remainder of the project above the bridge after the draw is changed. Nothing further is therefore recommended.

Cambridge Harbor is in the collection district of Baltimore, which is the nearest port of entry. The amount of revenue collected there during the fiscal year ending June 30, 1893, is $4,629,199.13.

AMOUNTS APPROPRIATED.

By act approved—	
March 3, 1871	$10,000
June 10, 1872	10,000
March 3, 1873	5,000
June 18, 1878	5,000
March 3, 1879	2,500
By act of August 11, 1888	5,000
By act approved—	
September 19, 1890	5,000
July 13, 1892	7,737

Money statement.

July 1, 1892, balance unexpended		$5,072.56
Amount appropriated by act approved July 13, 1892		7,737.00
		12,809.56
June 30, 1893, amount expended during fiscal year		1,101.45
July 1, 1893, balance unexpended		11,708.11
July 1, 1893, outstanding liabilities	$75.00	
July 1, 1893, amount covered by uncompleted contracts	4,503.62	
		4,578.62
July 1, 1893, balance available		7,129.49

Abstract of proposals for dredging in Cambridge Harbor, Maryland, received and opened May 11, 1893, by Gen. William F. Smith, United States Agent.

No.	Name and address of bidder.	Time		Price per cubic yard measured in scows.
		Commence.	Complete.	
				Cents.
1	Frank C. Somers, Camden, N. J	July 30, 1893	Nov. 30, 1893	12
2	Fred L. Somers, Philadelphia, Pa	July 15, 1893	Jan. 31, 1893	15½
3	Chester T. Caler, Norfolk, Va	July 10, 1894	Dec. 31, 1894	9½
4	American Dredging Co., Philadelphia, Pa	May 18, 1893	July 15, 1893	$9\frac{4}{10}$
5	Baltimore Dredging Co., Baltimore, Md	Sept. 1, 1893	Jan. 1, 1894	18

Contract with American Dredging Company.

COMMERCIAL STATISTICS.

Receipts and shipments.

Class.	Tons.
Receipts:	
Raw products	358
Manufactured products	2,665
Agricultural products	679
General merchandise	3,000
Total	6,702
Shipments:	
Raw products	14
Manufactured products	795
Agricultural products	680
General merchandise	850
Total	2,339
Total receipts and shipments	9,041

Vessels trading in Cambridge Harbor, Maryland.

Class.	No.	Aggregate tonnage.	Draft.	Tı
			Feet.	
Steamers	5	2,031	6	Triwe

The above statistics were furnished by Maryland Steamboat Company. St
were asked for from the Choptank Steamboat Company and from citizens
sailing-vessels trade, but none have been received.

H 18.

IMPROVEMENT OF BROAD CREEK RIVER, DELAWARE.

This river, formerly called Broad Creek, is in the western port
Sussex County, Del., and is a tributary of the east fork of the
ticoke River. It is a tidal stream and navigable for about 7
At the head of navigation is situated the town of Laurel, with
sive manufacturing and commercial industries.

The General Government expended $35,000 between the year
and 1889 in improving about 2 miles of the river at and immed
below Laurel. A channel 50 feet in width and 6 feet deep at mea
water was dredged, and the commerce of the river increased mor
100 per cent in eight years.

In accordance with the requirements of the river and harbor
September 19, 1890, a preliminary examination was made of this
with the view of enlarging the channel previously dredged. T
port with estimates is printed in the Annual Report of the Ch
Engineers for 1891, pp. 1209–1211. The plan of improvement t
recommended is to dredge the existing channel to a depth of 8 f
mean low water and to a width of 70 feet, beginning above
Bridge, about 3 miles below Laurel, at an estimated cost of $15,
The project was adopted during the last fiscal year, an appropri
of $5,000 being made by Congress July 13, 1892. Proposals for d
ing were opened October 7 following, and the lowest bidder was Ch

T. Caler, of Norfolk, Va., with whom a contract was made on October 27, 1892, at the price of 9.9 cents per cubic yard, measured in place. Operations were commenced on December 14, 1892, and were interrupted for several weeks during the following severe winter. On April 8, 1893, the contract was completed, 43,997 cubic yards of material, principally sand, having been removed. A channel of the approved dimensions, 70 feet wide and 8 feet deep at mean low water, was dredged for a distance of 6,455 feet, beginning at a point 1,000 feet above the bridge at Bethel and ending 680 feet above Hitchs upper wharf. An additional cut, also 8 feet deep but only 40 feet wide, was dredged for a length of 215 feet across a shoal situated just beyond the section of the channel that had been dredged to the full width.

The amount asked for, if appropriated, will be expended in continuing the improvements toward Laurel in accordance with the project.

Broad Creek River is in the collection district of Delaware. Wilmington is the nearest port of entry, at which the amount of revenue collected for the fiscal year ending June 30, 1893, is $14,368.14.

AMOUNTS APPROPRIATED.

By act approved—	
June 14, 1880	$5,000
March 3, 1881	10,000
By act passed August 2, 1882	5,000
By act approved August 5, 1886	10,000
By act of August 11, 1888	5,000
By act approved July 13, 1892	5,000

Money statement.

Amount appropriated by act approved July 13, 1892	$5,000.00
June 30, 1893, amount expended during fiscal year	4,900.45
July 1, 1893, balance unexpended	99.55
Amount (estimated) required for completion of existing project	10,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	10,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

Abstract of proposals for dredging in Broad Creek River, Delaware, received and opened October 7, 1892, by Gen. William F. Smith, United States Agent.

No.	Name and address of bidder.	Time.		Price per cubic yard measured in place.
		Commence.	Complete.	
				Cents.
1	Frank C. Somers, Camden, N. J	Jan. 1, 1893	June 30, 1893	11
2	American Dredging Co., Philadelphia	Dec. 1, 1892	Jan. 31, 1893	13
3	Atlas Dredging Co., Wilmington, Del	May 1, 1893	Sept. 30, 1893	13
4	Chester T. Caler, Norfolk, Va	Apr. 10, 1894	July 31, 1894	$9\frac{9}{10}$
5	Baltimore Dredging Co., Baltimore	May 15, 1893	In 60 working days.	$13\frac{1}{2}$

Contract with Chester T. Caler.

Commercial statistics were asked for but none have been furnished.

H 19.

IMPROVEMENT OF WICOMICO RIVER, MARYLAND.

An appropriation of $6,500 was made by the river and harb
of July 13, 1892, for continuing improvement. Proposals for dre
were opened on October 7, 1892, and the lowest bidder was Che
Caler, of Norfolk, Va., with whom a contract was made on Octo
1892, at the price of 9.9 cents per cubic yard, measured in scows.

At the end of the fiscal year operations had not yet been begu
it is expected that the contract will be completed, as agreed u
the contract, on May 30, 1894.

The adopted project for improvement is based upon a survey
in 1889, and is for a 9-foot channel at mean low water from the
depth in the river below, to the drawbridge at Salisbury, the wi
the channel to be 100 feet. The estimated cost of the improvem
$23,200.

At the close of the fiscal year ending June 30, 1892, $10,188.1
been expended and about 30 feet of the proposed width of the c
had been dredged throughout its full length to the approved de
9 feet.

Nothing was done during the past fiscal year, and the cut m
believed to be in a fair condition.

The amount asked for, if appropriated, will be expended in co
ing the approved project.

Wicomico River is in the collection district of the eastern district of Ma
Crisfield is the nearest port of entry, and the amount of revenue collected the
ing the fiscal year ending June 30, 1893, is $———.

AMOUNTS APPROPRIATED.

By act of—		By act of—	
June 10, 1872	$5,000	March 3, 1879	
March 3, 1873	5,000	June 14, 1880	
June 28, 1874	5,000	March 3, 1881	
March 3, 1875	5,000	July 5, 1884	
August 14, 1876	5,000	September 19, 1890	
June 18, 1878	5,000	July 13, 1892	

Money statement.

July 1, 1892, balance unexpended	$
Amount appropriated by act approved July 13, 1892	6,
	7,
June 30, 1893, amount expended during fiscal year	
July 1, 1893, balance unexpended	7,
July 1, 1893, amount covered by uncompleted contracts	7,
Amount (estimated) required for completion of existing project	6,
Amount that can be profitably expended in fiscal year ending June 30, 1895	6,

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for dredging in Wicomico River, Maryland, received and opened, October 7, 1892, by Gen. William F. Smith, United States Agent.

No.	Name and address of bidder.	Time.		Price per cubic yard, measured in scows.
		Commence.	Complete.	
				Cents.
1	T. P. Morgan, Washington, D. C	Nov. 1, 1892	120 working days.	14
2	F. C. Somers, Camden, N. J	June 30, 1893	Oct. 31, 1893	11.9
3	American Dredging Co., Philadelphia, Pa	Feb. 1, 1893	Mar. 31, 1893	14
4	Atlas Dredging Co., Wilmington, Del	Dec. 1, 1893	Apr. 1, 1894	14
5	C. T. Caler, Norfolk, Va	Jan. 15, 1893	May 30, 1894	9.0
6	Baltimore Dredging Co., Baltimore, Md	Feb. 1, 1893	In 60 working days.	12½

COMMERCIAL STATISTICS.

Commercial statistics were asked for but full returns have not been received. The Maryland Steamboat Company furnished the following:

LETTER FROM MR. JAMES E. BYRD, SECRETARY OF THE MARYLAND STEAMBOAT COMPANY.

BALTIMORE, *June 29, 1893.*

DEAR SIR: Replying to your favor of 28th instant, I beg to advise you that we have the steamer *Joppa* making triweekly trips between Baltimore and Salisbury, Md. Steamer draws 6 feet 6 inches loaded and is of 607.54 gross tons burden.

I estimate the amount of freight handled yearly to be 16,653 tons.

Yours, truly,

JAMES E. BYRD,
Secretary.

Gen. WILLIAM F. SMITH.

H 20.

IMPROVEMENT OF MANOKIN RIVER, MARYLAND.

An appropriation of $7,500 was made by the river and harbor act of July 13, 1892, for continuing improvement. Proposals for dredging were opened October 7, 1892. The lowest bidder was F. C. Somers, of Camden, N. J., with whom a contract was made on October 26, 1892, at the price of 9 cents per cubic yard, measured in place.

Operations were begun December 17, 1892, and on account of the unusually severe winter were much delayed. The contract was completed on March 31, 1893, a total of 54,123 cubic yards of material having been removed at the "Mud Flats," partly from the cut made in 1891, which had shoaled some, but principally from a new cut 30 feet wide parallel and adjacent to the first cut. The depth made was 6 feet at mean low water.

By authority of the Chief of Engineers, an agreement was made with the contractor to remove certain shoals and to round off several sharp turns in the river above the "Mud Flats," at his contract price of 9 cents per cubic yard, measured in place. Under this agreement 7,890 cubic yards were removed between Princess Anne, the head of navigation, and Sharp Point, and the aggregate length of the cuts made was

3,093 feet, varying in width between 30 and 60 feet, the le
made being 5 feet at mean low water.

The adopted project for improvement is for a 6-foot low-wa
nel, 100 feet wide, between Locust Point and Sharp Poi
embraces a section of the river 2½ miles long, generally c
"Mud Flats." The estimated cost is $30,000.

Up to the close of the fiscal year ending June 30, 1892, $7,3
been expended. At that time a cut had been made across t
Flats" 2½ miles long, 30 feet wide, and 5 feet deep at mean lo
and since the spring of 1891 the steamboat plying between
Anne and Deal Island has been enabled to make regular trips
less of the tide.

It is proposed to expend the amount asked for, if appropr
widening the channel across the "Mud Flats," in accordance
project.

Manokin River is in the collection district of the eastern shore of
Crisfield is the nearest port of entry, and the amount of revenue collected
ing the fiscal year ending June 30, 1893, is $——.

AMOUNTS APPROPRIATED.

By acts approved—
September 19, 1890 ....
July 13, 1892..

Money statement.

July 1, 1892, balance unexpended..
Amount appropriated by act approved July 13, 1892 ....

June 30, 1893, amount expended during fiscal year ....

July 1, 1893, balance unexpended..

Amount (estimated) required for completion of existing project....... 1
Amount that can be profitably expended in fiscal year ending June 30, 1895 1
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for dredging in Manokin River, Maryland, received and ope ber 7, 1892, by Gen. William F. Smith, United States agent.

No.	Name and address of bidder.	Time.	
		Commence.	Complete.
1	Thomas P. Morgan, Washington, D. C	Nov. 15, 1892	June 1, 1893
2	Frank C. Somers, Camden, N. J	Feb. 1, 1893	Oct. 31, , 1893
3	American Dredging Co., Philadelphia, Pa	Apr. 1, 1893	May 31, 1893
4	Atlas Dredging Co., Wilmington, Del	May 1, 1893	Oct. 1, 1893
5	Chester T. Caler, Norfolk, Va	Jan. 5, 1893	Apr. 10, 1893
6	Baltimore Dredging Co., Baltimore, Md	May 1, 1893	In 60 working days.

Contract with Frank C. Somers.

COMMERCIAL STATISTICS.

Receipts and shipments.

Class.	Tons.	Value.
Receipts:		
Bone, coal, cord wood. timber, and ice	6,341	$38,323
Bricks, canned goods, fertilizers, etc	5,206	181,235
Grain, hay, potatoes, butter, etc	1,427	36,828
General merchandise	118,800	2,376,000
Total	131,774	2,632,386
Shipments:		
Logs, railroad ties, and ship timber	10,955	96,337
Bricks, canned goods, flour, lumber, etc	2,198	62,475
Fruit, grain, hay, poultry, cattle, etc	5,814	188,716
General merchandise	24,150	966,000
Total	43,117	1,313,528
Total receipts and shipments	174,891	3,945,914

Besides one steamer of 4 feet draft making daily trips, there are about 300 schooners, sloops, pungies, etc., engaged in the coastwise trade sailing from the river.

The above statistics were furnished by Mr. H. P. Dashiell, general manager of the Manokin River Steamboat Company, and was accompanied by the following letter:

LETTER OF MR. H. P. DASHIELL.

PRINCESS ANNE, MD., *June 8, 1893.*

DEAR SIR: Our annual statement indicates an increase of, say, 5 per cent on outgoing and 8 per cent incoming business, on Manokin River for the past year. (The increase in business done by steamer was 35 per cent.)

Vessels are now loading at this wharf almost daily, which was almost unknown before dredging. The increase in shipments of fruits this year has been 50 per cent.

Yours, very respectfully,

HAMPDEN P. DASHIELL.

Gen. WILLIAM F. SMITH.

H 21.

IMPROVEMENT OF ONANCOCK HARBOR, VIRGINIA.

The river and harbor act of July 13, 1892, appropriated $6,511 for completing the present project for improvement. Proposals for dredging at the bar at the mouth of the river were opened October 7, 1892. The lowest bidder was Chester T. Caler, of Norfolk, Va., with whom a contract was made, dated October 26, 1892, at the rate of 13 cents per cubic yard, measured in scows. At the close of the fiscal year operations had not yet been begun, but it is expected that the contract will be completed on December 31, 1893, the time agreed upon in the contract.

The adopted project is for an 8-foot low-water channel 300 feet wide at the outer bar and 200 feet wide at the inner bar, called the Middle Ground, at an estimated cost of $12,511. At the close of the fiscal year ending June 30, 1892, $5,905.19 had been expended, and the channel at the outer bar had been dredged for a width of 150 feet and that at the inner bar for a width of 100 feet. Since then the dredged channel has shoaled slightly at the outer end.

The available funds will complete the project, and nothin recommended.

Onancock Harbor is in the collection district of Cherrystone, Va. City is the nearest port of entry. No revenue was collected during t ending June 30, 1893, the business consisting only of the licensing of ve

AMOUNTS APPROPRIATED.

By act approved—
March 3, 1879
June 14, 1880
September 19, 1890
July 13, 1892

Money statement.

July 1, 1892, balance unexpended
Amount appropriated by act approved July 13, 1892

June 30, 1893, amount expended during fiscal year

July 1, 1893, balance unexpended
July 1, 1893, amount covered by uncompleted contracts

Abstract of proposals for dredging in Onancock Harbor, Virginia, receive October 7, 1892, by Gen. William F. Smith, United States agen

No.	Name and address of bidder.	Time.	
		Commence.	Comple
1	Frank C. Somers, Camden, N. J	July 15, 1893	Oct. 15,
2	American Dredging Co., Philadelphia, Pa	June 1, 1893	July 31,
3	Atlas Dredging Co., Wilmington, Del	July 10, 1893	Oct. 1,
4	Chester T. Caler, Norfolk, Va	Oct. 24, 1893	Dec. 31,
5	Baltimore Dredging Co., Baltimore, Md	Mar. 15, 1893	In 60 wo ing da

Contract with Chester T. Caler.

COMMERCIAL STATISTICS.

Receipts and shipments.

Class.	Tons.
Receipts:	
Bone, coal, and ice	1, 55
Bricks, fertilizers, flour, furniture, etc	4, 56
Butter, cattle, grain, hay, poultry, etc	1, 04
General merchandise	15, 00
Total	22, 15
Shipments:	
Barrels and fertilizers	80
Berries, eggs, fruit, garden truck, etc	21, 05
Total	21, 85
Total receipts and shipments	44, 00

Vessels trading in the harbor at Onancock, Va.

Class.	No.	Aggregate tonnage.	Draft.	Trips.
			Feet.	
Steamers	4	1,937	7	Four times a week.
Schooners	9	382	6 to 8	Three times in two weeks.

The above statistics were furnished by Eastern Shore Steamboat Company.

H 22.

IMPROVEMENT OF HARBOR AND APPROACHES AT CAPE CHARLES CITY, VA.

There were no operations during the fiscal year ending June 30, 1893. The river and harbor act of July 13, 1892, appropriated $10,000 for continuing improvement;

> *Provided*, That before any Government money shall be expended in the improvement of this harbor or any of its approaches, the owners of the basin forming the harbor and the channel or canal leading thereto, or connecting said harbor with Cherrystone Inlet, shall execute, or cause to be executed, and file with the Secretary of War an instrument in writing satisfactory to the said Secretary of War, giving to any and all vessels, upon any and all occasions for all time to come, the right to enter and remain in said harbor and transact business therein without charge, except legitimate, usual, and reasonable wharf charges to be determined by the Secretary of War in event of disagreement, and shall further legally dedicate, or cause to be dedicated, to public use an approach to the wharves of said harbor from the nearest public highway of not less than forty feet in width, to be approved by the Secretary of War.

At the end of the fiscal year the owners of the harbor had not yet made any decision as to the proviso of the act.

The project for improvement adopted in 1890 is for dredging the harbor to a depth of 14 feet below mean low water and the entrance thereto, together with the present channel in Cherrystone Inlet and across Cherrystone Bar, to a depth of 16 feet below the same plane of reference; the channel in the inlet to be 100 feet, that across the bar 200 feet in width. The original project submitted with the report on the survey made in 1889 included also protective works of stone at the entrance, the total estimated cost of the whole improvement being $142,340.

Up to June 30, 1892, the sum of $22,345.56 had been expended and about one-half of the area of the harbor had been dredged to 14 feet below mean low water; a cut of 16 feet deep had been made within the entrance, 50 feet wide at the shore end and 480 feet wide at the outer end, or in Cherrystone Inlet channel, and a shoal one mile below the harbor was partially removed to the same depth. The dredged channels are supposed to be in a fair condition except the one at the entrance which has partially shoaled again.

It is proposed to continue operations as projected if the amount asked for is appropriated.

Cape Charles Harbor is in the collection district of Cherrystone, Va. Cape Charles City is the nearest port of entry. No revenue was collected during the fiscal year ending June 30, 1893, the business consisting only of the licensing of vessels, etc.

AMOUNTS APPROPRIATED.

By act approved—
September 19, 1890 ....
July 13, 1892 ....

Money statement.

July 1, 1892, balance unexpended ....
Amount appropriated by act approved July 13, 1892 ....

June 30, 1893, amount expended during fiscal year ....

July 1, 1893, balance unexpended ....

Amount (estimated) required for completion of existing project......
Amount that can be profitably expended in fiscal year ending June 30, 189
Submitted in compliance with requirements of sections 2 of river an
harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893

COMMERCIAL STATISTICS.

Receipts and shipments at Cape Charles City, Va., for year ending Decemb

Class.	Tons.
Receipts:	
Raw products	10, 48
Manufactured products	163, 28
Agricultural products	72, 46
General merchandise	11, 48
Total	257, 72
Shipments:	
Raw products	7, 93
Manufactured products	47, 98
Agricultural products	5, 79
General merchandise	21, 82
Total	83, 54
Total receipts and shipments	341, 26

Vessels trading in harbor at Cape Charles City, Va.

Class.	No.	Aggregate tonnage.	Draft.	Trips.
			Feet.	
Steamers	6	1, 757	6 to 9	Two daily; four triweekly.
Tugboats	3	514	8 to 9	Towing.
Schooners	75	1, 271	3 to 7	Irregular, in oyster and pro
Sloops	18	181	3 to 5	

The above statistics were furnished by Mr. William Cariss, jr., auditor
Philadelphia and Norfolk Railroad.

H 23.

REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR E ING NAVIGATION.

In June, 1893, the wreck of a small tugboat was reporte
gerously obstructing navigation in Mispillion River, at the
Mill Branch, about 2 miles below Milford, Del., and after an
tion and a report were made, authority was received, on Jun
for its removal, at an estimated cost of $150.

H 24.

PRELIMINARY EXAMINATION OF MOUTH OF ST. JONES RIVER, DELAWARE.

[Printed in House Ex. Doc. No. 34, Fifty-second Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 5, 1892.

SIR: I have the honor to submit the accompanying copy of report dated September 20, 1892, by W. F. Smith, United States Agent, Major of Engineers, U. S. Army, retired, of the results of a preliminary examination of mouth of St. Jones River, Delaware, made to comply with provisions of the river and harbor act approved July 13, 1892.

It is the opinion of the local engineer, concurred in by the division engineer and by this office, that the river is worthy of improvement by the General Government to the extent of redredging the mouth.

No survey will be required in order to submit project with estimate of cost of improvement proposed.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

Hon. S. B. ELKINS,
Secretary of War.

REPORT OF WILLIAM F. SMITH, UNITED STATES AGENT.

UNITED STATES ENGINEER OFFICE,
Wilmington, Del., September 20, 1892.

GENERAL: In compliance with Department letter of July 14, 1892, and the requirements of section 7 of the river and harbor act of July 13, 1892, I have the honor to submit the following report upon the preliminary examination of the mouth of St. Jones River, Delaware, made under my direction by Mr. A. Stierle, assistant engineer, a copy of whose report accompanies this.

The expenditure of a large sum of money in the construction of permanent protective works for a channel across the bar at the mouth of the river, such as is said to be desired by interested parties, does not seem warranted by the present and prospective demands of commerce.

A channel at the mouth of this stream, protected by banks of the material taken therefrom, was made in 1889 at a comparatively small cost, and was of great benefit to navigation. This channel, if it were cleared out periodically, would probably be the most economical plan of improvement for this locality, and to that extent I deem the mouth of the St. Jones River, Delaware, worthy of improvement by the General Government.

No survey would be required in order to submit a project, with estimate of cost of improvement, as the data obtainable from the maps and records on file in this office would suffice for that purpose.

Very respectfully, your obedient servant,

WM. F. SMITH,
United States Agent.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. William P. Craighill, Corps of Engineers, Division Engineer, Southeast Division.)

[First indorsement.]

U. S. ENGINEER OFF
Baltimore, Md., September

Respectfully submitted to the Chief of Engineers.

For the reasons set forth in the report of the local enginee
sidering the previous history of the river, I am of the opini
is "worthy of improvement by the General Government" to
of redredging the mouth.

WILLIAM P. CRAIGH
Colonel, Corps of E

REPORT OF MR. A. STIERLE, ASSISTANT ENGINEER.

UNITED STATES ENGINEER O
Wilmington, Del., Augu

SIR: In compliance with your instructions I have the honor to submi
ing report upon the preliminary examination of the mouth of St. Jones
ware.

St. Jones River is a tributary of Delaware Bay, and was under improv
General Government between the years 1885 and 1890. The result of t
ment, which was reported as completed, was a 6-foot low-water chan
less than 40 feet wide inside the river and 100 feet wide across the flats a
the total amount expended having been $40,000. The length of river i
cluding the channel at the mouth, is about 22 miles.

The original project submitted in 1881 for the improvement of the
river was for a 3-foot low-water channel 100 feet wide and for a jet
long at an estimated cost of $35,000. In 1889, when the improvements
were nearly completed and the demand for a deeper entrance became u
ification of the original project was proposed recommending a change i
ter of the jetty and substituting therefor banks of dredged material thr
each side of the contemplated cut. One of the main reasons tendin
change in construction was that the small appropriation, $15,000, th
was not sufficient for a timber jetty of the required length.

The method proposed was considered at the outset an experiment o
selected as a basis upon which, in the future, more reliable and prob
plans of improvement might be formed, doing away with costly timber j
construction is hardly warranted at streams having such limited comm
igation as the Delaware rivers generally have. Nearly all the rivers
had for years received the anomalous treatment of being improved fro
up, usually as far as navigation could be carried on at high water. Th
were left unimproved, rendering the improvements made within the
value, or "bottled up," as it were, for the time being. The St. Jones
first one, after being completely improved inside, that called for rem
be taken at the mouth, and the above project was therefore submitte
quently approved.

On November 27, 1889, the improvements at the mouth were complet
ance with the modified project. The actual amount of money expend
the cut, which in the middle was 60 feet wide and 6 feet deep and on
feet wide and 3 feet deep at mean low water, was $7,259.94, to which i
the cost of some piling, $1,280, making the total cost $8,539.94. The ban
material thrown up on each side of the cut were of considerable height f
feet out from the shore, and consisted for about one-third that distance o
mud. Beyond that, as the excavations became less deep, they barel
high-water level, and the material of which they were made was sand
large bowlders.

The condition of the channel after the lapse of nearly three years i
The originally dredged depth of 6 feet in the center has maintained it
tance of 2,100 feet from the shore and has in some places increased
feet. The black mud banks near the shore have settled to below hig
and portions of the gravel banks farther out are only visible at low ti
nants of the dikes appear to be still able to confine the outgoing ebb
gree as to maintain the original depth and over, as stated. About 2,
the shore scarcely any trace of the banks and channel is left, the bott

sumed its former depth, viz, 4 feet, and continues thence to deep water with its natural slope restored and unbroken. The cross section of the channel where it exists has been reduced about one-third, probably by filling in on the sides from settlement or washing in of the banks. As a whole, however, the improvements made, primitive as they were in character, have stood the destructive forces of this exposed locality much better and longer than was expected.

It is desired by those interested in the improvement of the St. Jones River that the channel at the mouth be widened and deepened, where necessary, to its former depth of 6 feet at mean low water, and that it should be protected along the north side by permanent works. By reference to the last annual report upon the improvement of St. Jones River, page 1165, Report of the Chief of Engineers for 1890, it will be seen that there are only 3 vessels, 1 steamer and 2 schooners, trading regularly in the river. The total receipts and shipments that year were stated by the owners to have been 27,777 tons, valued at $1,201,565. It is said that the amount of freight carried by the steamer has doubled since a new entrance was made. It is not likely, however, that the commerce and navigation on this river will at any time exceed its present limits. With the prospective improvement of Murderkill River, which flows close by, and the almost certain establishment of a steamboat line in that river, shipments would rather decrease.

In view of these facts it would seem unwarranted to expend a large sum of money in constructing expensive protective works at the mouth of the river. Probably the cheapest plan would be to redredge periodically the channel already made, especially since the amount of dredging required would be small. Should, however, a jetty be decided upon and built, it would form, in conjunction with a similar structure at the mouth of the Murderkill River, which empties into the bay about one-half of a mile below, a safe inclosure of a large sheet of water that could be utilized as a harbor of refuge by the great number of small vessels engaged in fishing and oystering on the bay.

Whatever plan may be adopted, the estimate of the cost, with the project, can be made from the charts already available, and no survey is necessary.

Very respectfully, your obedient servant,

A. STIERLE,
Assistant Engineer.

GEN. WM. SMITH,
United States Agent.

H 25.

PRELIMINARY EXAMINATION FOR INLAND WATERWAY CONNECTING THE MISPILLION AND BROADKILN RIVERS, DELAWARE, SO AS TO REOPEN THE NAVIGATION OF CEDAR, SLAUGHTER, AND PRIMEHOOK CREEKS.

[Printed in House Ex. Doc. No. 85, Fifty-second Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington D. C., December 5, 1892.

SIR: I have the honor to submit the accompanying copy of report, dated August 11, 1892, by W. F. Smith, United States Agent, Major of Engineers, U. S. Army, retired, of the results of a preliminary examination for inland waterway connecting the Mispillion and Broadkiln rivers, Delaware, so as to reopen the navigation of Cedar, Slaughter, and Primehook creeks, made to comply with provisions of the river and harbor act approved July 13, 1892.

It is the opinion of the local engineer, concurred in by the division engineer and by this office, that this inland waterway is not worthy of improvement by the General Government.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

HON. S. B. ELKINS,
Secretary of War.

REPORT OF WM. F. SMITH, UNITED STATES AGE

UNITED STATES ENGINEER O
Wilmington, Del., Augus

GENERAL: In compliance with instructions contained
ment letter of July 14, 1892, and the requirements of sect
river and harbor act of July 13, 1892, I have the honor t
following report upon the preliminary examination for inla
connecting the Mispillion and Broadkiln rivers, Delaware
open the navigation of Cedar, Slaughter, and Primehook
under my direction by Mr. A. Stierle, assistant engineer.

In view of the facts and for the reasons given in the
assistant engineer, a copy of which accompanies this, the
way connecting the Mispillion and Broadkiln rivers, Del
to reopen the navigation of Cedar, Slaughter, and Prime
taking into consideration the present and prospective dem
merce, is, in my opinion, not worthy of improvement by
Government.

Very respectfully, your obedient servant,

WM. F. S
United St

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. Wm. P. Craighill, Corps of Engineers,
gineer, Southeast Division.)

[First indorsement.]

U. S. ENGINEER O
Baltimore, Md., Augus

Respectfully submitted to the Chief of Engineers.

I agree with the district engineer that this waterway i
of improvement by the United States.

WM. P. CRAI
Colonel, Corps of

REPORT OF MR. A. STIERLE, ASSISTANT ENGINEER.

UNITED STATES ENGINEER
Wilmington, Del. A

SIR: In compliance with your instructions I have the honor to sub
ing report upon the preliminary examination for an inland waterway
Mispillion and Broadkiln rivers, Delaware, so as to reopen the navig
Slaughter, and Primehook creeks.

The streams under consideration are situated in the northeast se
County, Del., and are tributaries of Delaware Bay, into which they
erly direction and generally parallel to each other. Their sources li
of the peninsula about 15 miles in a straight line from the bay shore.

The most southerly one is the Broadkiln, which is also the largest
the town of Milton at the head of navigation about 11 miles abo
About 3 miles north of the Broadkiln is Primehook Creek, once, it is s
deep stream, but now a stagnant pool of water, whose outlet has been
by the action of the sea and drift sand in the bay. About 3 miles to
is Slaughter Creek, the smallest of these streams. Its former outlet i

Cedar Creek is about 4½ miles north of Slaughter Creek, its general course being more northeasterly than the others. It is a creek of great length, but small in width and depth, the natural outlet having also closed up about twenty years ago. A new outlet in the form of a large ditch was subsequently made into the Mispillion River, Cedar Creek thus becoming a tributary of the latter. This ditch, which is about 2 miles long, 25 feet wide on an average, and 5 feet deep at high water, was dug at the expense of the adjoining landowners about seventeen years ago, at a cost of about $3,000.

The Mispillion River, the most northerly of the group, is the second largest in size and the most important from a commercial point of view. Milford is at the head of navigation about 12 miles above the mouth.

Both the Broadkiln and Mispillion have been improved during the past twenty years by the General Government from the mouth up as far as the tide flows, giving to each a 6-foot low-water channel. The amount expended in these improvements was, respectively, $35,000 and $17,000. The mouths of both rivers are obstructed by bars having a depth of water of 1½ feet at low tide and an average rise of the tide of 4 feet, and are still unimproved, projects for improvement having been submitted for the Broadkiln in 1871 and for the Mispillion in 1891. There are prospects that the entrance at the mouth of the latter river will soon be opened, an appropriation of $12,000 having been recently made by Congress for its improvement. Notwithstanding the obstructions at the mouth the amount of commerce in both rivers is large, having reached during the past year 38,741 tons, valued at $324,000, in the Broadkiln, and 67,398 tons, valued at $1,051,450, in the Mispillion.

The present commerce in Cedar Creek is said to amount to about $100,000 per annum. Six sailing vessels trade in and out of this creek, carrying phosphate, lime, grain, wood, lumber, and canned fruit. These vessels go as far as Davis Landing, 4 miles above the junction of the canal with the Mispillion River, and, of course, have to use the mouth of this river to pass in or out of the bay.

It is stated that about thirty-five years ago small schooners trading to New York and drawing 6 feet of water, sailed in Slaughter Creek as far as Draper Landing, where the old brick granary is still standing.

Primehook Creek had about that time also an open navigation. The coast survey chart of the Delaware Bay, plotted from surveys made in 1842, shows open outlets for both creeks. All shipments of freight from and to the adjoining country are now made either by the way of the Broadkiln or Cedar Creek Canal. An approximate value of these shipments could not be ascertained.

It is the desire of the landowners and farmers in the vicinity of the five streams mentioned in the bill, and especially of those living near the creeks whose outlets are closed, to connect them together by a canal about 20 feet wide and 6 feet deep at low water. The most favorable route for the canal would be through the marshes, about three-quarters of a mile from and nearly parallel with the shore of the bay, the southern end to join the Broadkiln near Hazzard's Landing, 3 miles above the present mouth of this river, and the northern end to lead into the Mispillion along the line of Cedar Creek Canal. The total length of this waterway would be about 12 miles, two of which are in the above canal, which needs deepening, and 5 miles along small ditches already dug that could be utilized.

* * * * * * *

The construction of such a canal would undoubtedly be of great benefit to the adjoining country in the matter of drainage, and in decreasing the cost of hauling to and from the present shipping points. It would also give a new stimulus to the raising of produce, now debarred through want of navigation from reaching the markets in time, and would eventually become a valuable feeder if extended southwardly to the inland waterway now in process of construction between Chincoteague Bay and Delaware Bay, whose outlet will be in deep water under the shelter of the Delaware Breakwater Harbor. But in view of the facts that neither the Mispillion nor the Broadkiln possess at present an unobstructed outlet for low-water navigation, and that the improvement would be an expensive one, taking into consideration all possible increase in the present and the prospective commerce, I do not think the reopening of navigation of Primehook, Slaughter, and Cedar creeks as worthy of improvement.

Very respectfully, your obedient servant,

A. Stierle,
Assistant Engineer.

Gen. William F. Smith,
United States Agent.

H 26.

PRELIMINARY EXAMINATION OF POCOMOKE RIVER, MARYLA A VIEW OF UNITING THE WATERS OF SAID RIVER WITH THE OF SYNEPUXENT BAY AT A POINT ABOVE SNOW HILL.

[Printed in House Ex. Doc. No. 94, Fifty-second Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES AR
Washington, D. C., December

SIR: I have the honor to submit the accompanying copy dated August 16, 1892, by W. F. Smith, United States Age of Engineers, U. S. Army, retired, of the results of a pr examination of Pocomoke River, Maryland, with a view of u waters of said river with the waters of Synepuxent Bay a above Snow Hill, made to comply with the provisions of the harbor act approved July 13, 1892.

It is the opinion of the local engineer, concurred in by the engineer and by this office, that the route is worthy of improv the General Government.

It is estimated that the surveys necessary for preparatio and project with estimates of the improvement proposed can for $800.

Very respectfully, your obedient servant,

THOS. LINCOLN CAS
Brig. Gen., Chief of En

Hon. S. B. ELKINS,
Secretary of War.

REPORT OF WILLIAM F. SMITH, UNITED STATES AGE

UNITED STATES ENGINEER OFFI
Wilmington, Del., August 1

GENERAL: In compliance with instructions contained in De letter of July 14, 1892, and the requirements of section 7 of and harbor act of July 13, 1892, I have the honor to submit t ing report upon the preliminary examination of Pocomok Maryland, with a view of uniting the waters of said river waters of Synepuxent Bay at a point above Snow Hill, ma my direction by Mr. A. Stierle, assistant engineer, a copy report accompanies this.

The connection between the Pocomoke River and Synepux deemed of the greatest importance to the commerce between apeake and Delaware bays, affording a thoroughly safe rout these bays without the danger of ocean navigation, and woul increase the intrinsic value of the inland waterway betwee teague Bay and Delaware Bay.

The route is well worthy of improvement and a survey mended. The least amount required to make a survey and re project and estimate of cost of improvement is $800.

Very respectfully, your obedient servant,

WM. F. SMITH,
United States

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. Wm. P. Craighill, Corps of Engineers, Divis neer, Southeast Division.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., August 18, 1892.

Respectfully submitted to the Chief of Engineers.

Having in view the facts and reasons set forth in the report of the local engineer and the standard set by Congress in similar cases, I state, as required by the law, that this work is "worthy of improvement."

WM. P. CRAIGHILL,
Colonel, Corps of Engineers.

REPORT OF MR. A. STIERLE, ASSISTANT ENGINEER.

WILMINGTON, DEL., *August 13, 1892.*

SIR: In compliance with your instructions I have the honor to submit herewith a report upon the preliminary examination of Pocomoke River, Maryland, with the view of uniting the waters of said river with the waters of Synepuxent Bay at a point above Snow Hill.

It is understood from the promoters of the project that the idea of a connection between the waters named suggested itself and has been elaborated upon since the inland waterway between Chincoteague Bay, Virginia, and Delaware Bay has been commenced: the purposes of the improvement have therefore a wider scope than is indicated in the bill.

It appears also that Synepuxent Bay as an eastern terminus of the water connection is not, as first understood, the narrow bay generally shown on recent charts (especially on those of the Coast Survey Department) between Chincoteague Bay and Isle of Wight Bay, but includes, according to local traditions, the upper portion of Chincoteague Bay as far south as the Virginia State line. That always some uncertainty existed with regard to the exact line where Chincoteague Bay and Synepuxent Bay meet is shown by the fact that on older editions of the Coast Survey charts the sheet of water now generally known as Chincoteague Bay has two distinct names, the lower portion up to a line extended across from near Green Run Inlet, which is now closed, being Chincoteague Bay, and the portion north of it to Synepuxent Sound being Assateague Bay. (See chart of the Atlantic Coast from Cape Sable to Cape Hatteras, published in 1877.) The maps of Worcester County, contained in an atlas of the State of Maryland published many years ago, also give Assateague Bay as the name of the upper portion, but the narrow strip of beach between the bay and the ocean is called Synepuxent Beach.

The characteristics of the bay shore on each side would indicate that immediately north of Green Run Inlet the bay was once divided by low marshy land through which narrows or thoroughfares flowed, which have gradually widened by the shore washing away. This may give a remote reason for the existence of separate names for the upper and lower portion of the bay. As the bill calls for the connection of Pocomoke River with Synepuxent Bay it became necessary to obtain all the information possible upon this point; in addition, the framers of the bill positively assert that the upper portion of Chincoteague Bay, locally known as Synepuxent Bay, was kept in view as the best outlet for the suggested water connection.

The Pocomoke River rises in the Great Cypress Swamp in the lower part of Sussex County, Del., and is about 60 miles long from its source to its entrance into Pocomoke Sound. Its course is southerly to Snow Hill, then southwesterly to the mouth, and generally parallel with the coast line, which lies about 16 miles to the eastward of it. The tide ascends the river for 33 miles to Porter Landing, where a slight daily rise and fall is still observable. At Snow Hill, which is only 5 miles below this landing and 28 miles above the mouth, the average rise and fall is about 2.6 feet.

This river has been improved by the General Government below Snow Hill. At the close of operations in 1888 a 7-foot low-water channel 80 feet wide was reported as completed to the town. There is no navigation above Snow Hill on account of the county bridge, which crosses here, having no draw. The depth in the channel for 2 miles above the bridge is fair, however, the least being 6 feet at low water, with occasional depths of 10 and 12 feet. Above tidal influence the bed of the river rises gradually, and is at many places bare during very dry seasons.

Chincoteague Bay is, through Chincoteague Inlet, connected with the ocean, and is from 4 to 5 miles wide. Its length from Killick Shoal light, near the inlet channel, to South Point, on Synepuxent Neck, is about 21 miles. It is connected on the

north by the Straits of Synepuxent Bay, also called Synepuxent Sound, v
Wight, Big and Little Assawaman bays, and by a canal, forming a sec
inland waterway, with Indian River and Rehoboth bays, the head of the
being about 60 miles north of Chincoteague Inlet. A waterway, givi
low-water navigation in these bays, is now in process of constructio
eventually be extended to Delaware Bay.

The Pocomoke River approaches the bay nearest at and immediately a
Hill, where the distance, in a straight line across the intervening lan
miles. There are, besides, other physical conditions which are unusuall
for a water connection. About 1 mile above Snow Hill, where the dept
in the river is still ample and the tide considerable, a deep branch, th
Purnells Millpond, empties into the river. Three smaller branches ru
millpond as feeders from an easterly, southeasterly, and southerly direc
are of about the same length. On the bay side opposite two small creek
Creek, the most northerly, and Pow Pow Creek, the most southerly, ab
apart, flow into Chincoteague Bay. From the head of these branches
low ravines extend into the adjoining highlands.

There are two lines which present themselves as the most feasible fo
canal from the Pocomoke River to the bay. The first is along the easterl
Purnells Millpond to its head for about 2¼ miles; then across the divi
mile; then down Scarboro Creek to the bay 3 miles, a total distance o
miles. The second follows the southeasterly or middle branch of the r
its head 3 miles; then across the highland about 1¼ miles, then dow
Creek into the bay about 1¾ miles, a total distance of about 6¼ miles. T
elevation of the bottom of the branches and creeks may not be over 4 fee
low-water level of Pocomoke River; that of the intervening highland
over 15 feet; the necessary excavations along either of the two routes
very large or deep. The Pow Pow Creek route apparently offers the best
harbor in the bay, but the advantages and disadvantages of each line
stated until an actual survey is made.

It is not expected that in the immediate locality commerce would be
creased by the improvement asked for if made. The improvement is
one, as the benefits derived from it would affect the general commerce o
lower Chesapeake Bay and the Atlantic coast from Cape Charles to Cape
and also indirectly the coastwise trade carried on by a large class of sm
It would form an important link and feeder of the inland waterway bet
coteague Bay and Delaware Bay by drawing toward it a large amount o
from the westward, which is now entirely cut off and which seeks an outle
to northern markets in competition with Baltimore. It is impossible t
accurately what the amount of commerce would be passing through suc
made, but it is safe to say that it would not be less than $5,000,000 per a
the completion of the inland waterway. The connection of the waters o
River and Synepuxent Bay, so called, is worthy of improvement, in my o
a survey is needed to prepare plans and estimates, the cost of which wil

Very repectfully, your obedient servant,

A. STI
Assistant

Gen. WILLIAM F. SMITH,
United States Agent.

H 27.

PRELIMINARY EXAMINATION OF NANTICOKE RIVER, DELA

[Printed in House Ex. Doc. No. 120, Fifty-second Congress, second session.

OFFICE OF THE CHIEF ENGINEERS,
UNITED STATES AR
Washington, D. C., December

SIR: I have the honor to submit the inclosed copy of rep
August 4, 1892, by W. F. Smith, United States Agent, Majo
neers, U. S. A., retired, of the results of preliminary exami
Nanticoke River, Delaware, made to comply with requireme
river and harbor act approved July 13, 1892.

I concur in the opinion of the local and division engineers that the river is worthy of improvement by the General Government.

An estimate of $500 is submitted as the cost of the surveys necessary to the preparation of plan and report with project and estimate of the improvement proposed.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

Hon. S. B. ELKINS,
Secretary of War.

REPORT OF WILLIAM. F. SMITH, UNITED STATES AGENT.

UNITED STATES ENGINEER OFFICE,
Wilmington, Del., August 4, 1892.

GENERAL: In compliance with instructions contained in Department letter of July 14, 1892, and the requirements of section 7 of the river and harbor act of July 13, 1892, I have the honor to submit the following report upon the preliminary examination of Nanticoke River, Delaware, made under my direction by Mr. A. Stierle, assistant engineer.

In view of the facts, and for the reasons set forth in the report of the assistant engineer, a copy of which accompanies this, Nanticoke River, Delaware, is, in my opinion, worthy of improvement by the General Government, and a survey is recommended.

The least amount required to make the survey and report with project and estimate of cost of improvement is $500.

Very respectfully, your obedient servant,

WM. F. SMITH,
United States Agent.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. Wm. P. Craighill, Corps of Engineers, Division Engineer, Southeast Division.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., August 9, 1892.

Respectfully submitted to the Chief of Engineers.

There has been great commercial progress in the last ten or fifteen years on the peninsula between Chesapeake and Delaware bays, due to the improvement of water courses and the building of railroads. From personal knowledge, and in view of the facts and reasons set forth in the report of the local engineer, I am of the opinion, and so report as required by the law, that, taking into account the present and prospective demands of commerce, the Nanticoke River, Delaware, is "worthy of improvement by the General Government."

WM. P. CRAIGHILL,
Colonel, Corps of Engineers.

REPORT OF MR. A. STIERLE, ASSISTANT ENGINEER.

UNITED STATES ENGINEER O
Wilmington, Del., Aug

SIR: In compliance with your instructions, I have the honor to subm
ing report upon the preliminary examination of Nanticoke River, Dela

The headwaters of the Nanticoke River consist of numerous bra
mainly in the northern section of Sussex County, Del., two of the
called Middleford and Deep Creek. The river flows in a south-southw
tion into Tangier Sound, Chesapeake Bay, its most prominent tribu
from the east, Broad Creek River, in Delaware, and from the north,
Creek, also called the Northwest Fork, in Maryland. After passing t
State line the river enters Maryland and forms the boundary line
chester and Wicomico counties to its mouth. The river is essentially a
the influences of the tide being felt above the junction of the head bran
ford and Deep Creek—in the latter as far as the town of Concord, 43
the mouth.

With the exception of one shoal, about 1 mile below the mouth
Creek, which has a depth of 9 feet at low tide and a very contracted ch
as the "swash channel," the river has up to the Delaware State line am
width for present navigation. At Vienna, Md., about 25 miles above th
Baltimore and Eastern Shore Railroad crosses the Nanticoke [illegible]
which is an iron draw 40 feet in width. About 1¼ miles above Sh[illegible]
Delaware line, the characteristic continuity and uniformity of depth i
disappear and thence numerous shoals and bars obstruct the river, w
more pronounced as the head is approached. None of the obstructi
ever, of great extent and can be readily removed at comparatively litt
make a fair channel. From Truitts Wharf near the State line to bel
of Broad Creek River, a distance of about 1¼ miles, shoals with a mini
8 feet at low tide prevail, the bottom being hard, stiff clay. From
Broad Creek River to Ellis Wharf the depth in the channel is over
the following reach of the river, for about one quarter of a mile, it
feet, after which it increases again to 12 feet as far as Cannons Fer
point the width of the channel appears to be sufficient for the maneu
sels.

From Cannons Ferry to the head of navigation at Seaford, Del.,
nearly 5 miles, the channel is generally shoal and narrow and [illegible]
to 10 feet in depth. At the lower wharves at Seaford the depth
about 7 feet. Within and above the draw of the Delaware Railroad
crosses the Nanticoke here, a shoal exists with only 5¼ feet of water
tide. Many sailing vessels and steamers pass through this draw daily,
occurred that one of these steamers remained aground in the draw
The depth of water above the railroad bridge as far as the iron co
section about one quarter of a mile in length, appears to be sufficient
needs of navigation. This section forms the harbor proper at Seaford.

The interests for the improvement of Nanticoke River center at S
town has about 2,500 inhabitants; about 35 stores; 2 fertilizer compan
annual capacity of 15,500 tons; 2 canning establishments employing
in season, the main work being done by machinery; 5 oyster-packing
flour and 2 saw mills. The surrounding country is said to be the bes
fruit culture and is in a high state of cultivation. It is stated that,
ing the large shipments by rail, the commerce by water of grain, fruit
ters, wood, etc., amounts to not less than $3,000,000 annually.

Seaford is the terminus of two steamboat lines, running daily boats fr
About 100 oyster vessels are employed during the season, and six scho
from 75 to 650 registered tonnage, are owned in town and make regular
out the year to southern and eastern ports.

Mr. W. M. Ross, the owner of the largest fertilizer works, who kin
the above statistics, states that his vessels, the largest of which draw
laden, experience much difficulty in proceeding up the river and are
quent delays on account of the shoal water below Seaford during lo
same trouble is reported by the steamboat companies, whose boats
can not reach the upper wharves. The deep-draft sailing vessels ofte
three high tides in the river before they reach their destination. The
therefore, suggest that a 12-foot low-water channel 100 feet wide is nee
from deep water below to the county bridge at Seaford. It is not
much dredging is required to make such a channel.

It is estimated that if the improvement is made the commerce on
increase to double its present value, as many large factories would

raw material could be more readily obtained by water. The river is worthy of improvement.

The public records show that that portion of the Nanticoke River under examination has been surveyed by the Engineer Department under the direction of Major, now Colonel, Wm. P. Craighill, Corps of Engineers, in 1878. The charts then made may be of great value for study if the river is recommended for improvement. As, however, many physical changes may have taken place since that time, especially at Seaford, a detailed survey of the present shoals is needed, which can be made for $500.

Very respectfully, your obedient servant,

A. STIERLE,
Assistant Engineer.

Gen. WILLIAM F. SMITH,
United States Agent.

H 28.

PRELIMINARY EXAMINATION OF BLACK WALNUT HARBOR, AT THE MOUTH OF GREAT CHOPTANK RIVER, MARYLAND.

[Printed in House Ex. Doc. No. 69, Fifty-second Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 5, 1892.

SIR: I have the honor to submit herewith a copy of report dated September 1, 1892, by W. F. Smith, United States Agent, Major of Engineers, U. S. Army, retired, of the results of a preliminary examination of Black Walnut Harbor, Maryland, at the mouth of Great Choptank River, made to comply with the provisions of the river and harbor act approved July 13, 1892.

I concur in the views of the local engineer and the division engineer that this harbor is not worthy of improvement by the General Government.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

Hon. S. B. ELKINS,
Secretary of War.

REPORT OF WILLIAM F. SMITH, UNITED STATES AGENT.

UNITED STATES ENGINEER OFFICE,
Wilmington, Del., September 1, 1892.

GENERAL: In compliance with instructions contained in Department letter of July 14, 1892, and the requirements of section 7 of the river and harbor act of July 13, 1892, I have the honor to submit the following report upon the preliminary examination of Black Walnut Harbor, Maryland, at the mouth of Great Choptank River, made under my direction by Mr. A. Stierle, assistant engineer.

It appears from the accompanying report of the assistant that the improvement desired by the inhabitants of the locality is the dredging of a channel from deep water in the Choptank River up to a private wharf in the harbor with the view of making it an inducement for steamers navigating those waters to run in.

In view of the fact that such a channel would cost but a comparatively small sum of money, and that the information received from steamboat owners is such that they do not consider the proposed channel as of any benefit in the way of getting business for their boats, Black Walnut Harbor, Maryland, is, in my opinion, not worthy of improvement by the General Government.

Very respectfully, your obedient servant,

WM. F. SMITH,
United States Agent.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. Wm. P. Craighill, Corps of Engineers, Division Engineer, Southeast Division.)

[Third indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., September 22, 1892.

Respectfully submitted to the Chief of Engineers.

For the reasons set forth in the report of the local engineer I do not consider this locality "worthy of improvement by the General Government."

WM. P. CRAIGHILL,
Colonel, Corps of Engineers.

REPORT OF MR. A. STIERLE, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Wilmington, Del., August 20, 1892.

SIR: In compliance with your instructions, I have the honor to submit herewith a report upon the preliminary examination of Black Walnut Harbor, mouth of Great Choptank River, Maryland.

Black Walnut Harbor is on the southern extremity of Tilghman Island, in Talbot County, Md., on the north side of and just inside the mouth of the Choptank River. It is a natural cove between two long points of land which project from the island, and is sheltered from all points of the compass, except from the south and the southeast. The protected area of the harbor measures about three-quarters of a square mile. The water is very shallow, the 6-foot contour running more than one-quarter of a mile from and parallel with the shore. About 2 feet is the average rise and fall of the tide. Tilghman Island is a portion of the long peninsula called Bay Hundred, which is about 15 miles long and is divided from the main body by a small thoroughfare called Knapps Narrows. The portion embracing the island is about 4 miles long and from three-fourths to 1¼ miles wide.

About five years ago a company built a pier 1,300 feet long from the north shore into the cove in an almost southerly direction to the 6-foot depth in the harbor. This pier is much used during the winter season by small oyster vessels; its main object, however, was to induce the steamboats plying upon the Choptank River to land there. The depth of water at the head of the pier and from there out into the main channel was subsequently discovered to be insufficient for these steamers, whose draft of water generally exceeds 8 feet. The inhabitants of the island and a large number living on the shores of adjoining creeks ask, therefore, that a channel 10 feet in depth be dredged from that depth in the Choptank River to the wharf, so that the above steamboats can land there at any stage of the tide. From soundings taken on the spot I infer that the length of the required cut would not be over 900 feet. The bottom is stiff blue mud and promises permanency in the channel, if made.

The villages and settlements interested in the above improvement are Fairbank, Island City, Lewistown, and Tilghmans on Tilghman Island, Sherwood and Wittmans on the peninsula above, and that portion of St. Michaels district situated between Harris and Broad creeks, which includes the villages of Broad Creek, Long

Point, Nevitts, and Bozmans. The total population of the villages named is at present about 2,000, and is rapidly increasing, having doubled within the last six years. The majority of the people depend upon the oyster business for a living, and nearly all own a house and small tract of land. There are also several large farms, the soil being unusually fertile and well adapted for the raising of grain. How large the oyster business is can best be shown by stating that in the immediate vicinity of Black Walnut Harbor about 100 bugeyes and 300 canoes, both belonging to the smaller class of sailing vessels, are owned, which, when engaged during the oyster season in dredging and tonging oysters, employ about 1,300 men. As the output of a bugeye is about 4,000 bushels per season, and that of a canoe 800 bushels, the total earnings from this source amount to not less than $320,000 per annum. .

On an average five bugeyes of 10 tons burden each are built on the island each year. Twenty stores are located in the country adjacent to and depending upon the improvement of this harbor whose annual sales amount on an average to $10,000 each. The nearest railroad station by land is McDaniels, on the Baltimore and Eastern Shore Railroad, and the nearest by water is Oxford, on the Delaware and Chesapeake Railroad, 10 miles to the eastward, which is also a regular landing place for Baltimore steamboats. A steamboat stops twice a week at Lows Wharf, a landing on the bay side of Bay Hundred, 8 miles north of Black Walnut Harbor. These are the nearest points from which freight is shipped and received, except that which is brought direct from or taken to Baltimore in small vessels. It is a heavy tax, both in money and time to the people, as the hauling by wagons and boats from and to these points adds greatly to the cost of the necessaries of life, building material, fertilizers, etc.

A landing, as a distributing point more centrally located in the district and giving frequent and better facilities for receiving and shipping freight of all kind, is urgently needed. It is stated that if deeper water could be made at the head of the pier in Black Walnut Harbor, a number of oyster-packing houses would be erected shortly, the location, in the midst of thousands of acres of fine oyster beds which cover the bottom of adjoining waters, being a most favorable one.

Notwithstanding the urgency of the case, it seems to me that the improvement asked for, which consists in dredging an artificial channel up to a wharf belonging to a private corporation, should be left to private enterprise. * * *

Very respectfully, your obedient servant,

A. STIERLE,
Assistant Engineer.

Gen. WILLIAM F. SMITH,
United States Agent.

APPENDIX I.

IMPROVEMENT OF PATAPSCO RIVER AND BALTIMORE HARBOR, MARYLAND, AND JAMES RIVER, VIRGINIA.

REPORT OF COL. WILLIAM P. CRAIGHILL, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1893, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Patapsco River and channel to Baltimore, Md.
2. Channel to Curtis Bay, in Patapsco River, Baltimore Harbor, Maryland.
3. James River, Virginia.
4. Removing sunken vessels or craft obstructing or endangering navigation.

EXAMINATION.

5. South and middle branches of Patapsco River, Baltimore, Md.

UNITED STATES ENGINEER OFFICE,
Baltimore, Md., July 8, 1893.

GENERAL: I have the honor to forward herewith the annual reports for the year ending June 30, 1893, for the works of improvement of rivers and harbors which have been in my charge.

During the year I have also been Division Engineer of the Southeast Division and member of several special boards.

Very respectfully, your obedient servant,

WM. P. CRAIGHILL,
Colonel, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

I 1.

IMPROVEMENT OF PATAPSCO RIVER AND CHANNEL TO BALTIMORE, MD.

The river and harbor act of September 19, 1890, contained the following clause:

> *Provided,* That such contracts as may be desirable may be entered into by the Secretary of War for the completion of the existing project, or any part of same, to be paid for as appropriations may from time to time be made by law.

By advertisement of September 30, 1890, proposals were ir
completing the channel to a width of 600 feet, with a depth
at mean low water, which were received December 2. The con
awarded to the American Dredging Company of Philadel
10½ cents per cubic yard for removal and redeposit, to cover
cubic yards of material. The time for completion of the work w
1, 1893, but it was finished in December, 1892.

Work under the contract began February 17, 1891, and w
tinued vigorously, except when prevented by bad weather, u
cember 6, 1892, when it was completed. The channel is now
deep at mean low water, with a width throughout of not le
600 feet, and more at the turns.

There have been excavated during the fiscal year the fo
amounts of material:

	Cu
From Fort McHenry division	
From Brewerton division	
From Cutoff division	
From Lower division	
Total amount removed during the fiscal year	1,
Redeposited below Rock Point	
Redeposited eastward of Lower division	1,
Total removed under this contract:	
In year ending June 30, 1891	1, 3
In year ending June 30, 1892	3, 5
In year ending June 30, 1893	1, 3
	6, 21

FORT M'HENRY DIVISION.

The areas excavated in this division during the fiscal year were:
southwest side of channel, 10,820 by 55 feet, 36,460 by 50 feet, 1
by 45 feet, 2,510 by 40 feet, 3,828 by 25 feet, and 6,163 by 20 feet,
total area on southwest side of 310,286 square yards; on northeast
of channel the areas excavated were: 4,500 by 50 feet, 1,380 by 45 f
and 1,335 by 20 feet, or a total area on northeast side of 34,866 squ
yards.

BREWERTON DIVISION.

The area excavated in this division was 4,055 by 40 feet, being
moval of deposits within the 400-foot channel limits.

CUTOFF DIVISION.

The areas excavated in this division were: On southwest side 5,4
by 50 feet, 2,440 by 66⅔ feet, 112 by 33⅓ feet, and 22,140 by 45 feet,
a total area on southwest side of 160,716 square yards. There w
also excavated in this division an area of about 90,000 square yar
within the limits of the 400-foot channel.

LOWER DIVISION.

On the east side of this division there was excavated an area o
6,560 by 50 feet; in addition to this an area of about 92,000 squar
yards was excavated within the limits of the 400-foot channel. All excavations mentioned are to a depth of 27 feet at mean low water.

The *Fort McHenry division*, extending from the city limits of Balti-

more to the upper end of the Brewerton division, is 28,500 feet long, with a minimum width of 600 feet, and at its upper end, for a distance of about 6,500 feet, its width is 800 feet.

Brewerton division.—This division extends from the lower end of the Fort McHenry division to the upper end of the Cutoff division; it is 23,500 feet in length and 600 feet in width.

Cutoff division.—This division is 23,100 feet in length, with a minimum width of 600 feet. It extends from the lower end of the Brewerton to the Lower division.

Lower division.—This extends from the Cutoff division to deep water of the Chesapeake Bay; it is 2,400 feet long and 600 feet wide.

Angles.—At the junctions of the Fort McHenry and Brewerton and of the Brewerton and Cutoff divisions the maximum width is 1,000 feet, and at the junction of the Cutoff and Lower divisions the maximum width is 1,250 feet.

A resurvey is in progress of the whole area covered by the channel and to the shores on either side.

It should not be forgotten that this channel, like all artificial highways, needs attention and repairs to keep it in proper order, and the amount of repairs and consequent cost will increase rapidly if not promptly attended to at the proper times, which is *once every year.*

The following are the amounts and dates of appropriations for improving harbor at Baltimore, Md., including Patapsco River:

August 30, 1852	$20,000	March 3, 1879	$160,000
August 15, 1856	100,000	June 14, 1880	100,000
June 23, 1866	5,200	March 3, 1881	150,000
March 2, 1867	75,000	August 2, 1882	450,000
July 25, 1868	17,000	July 5, 1884	250,000
April 10, 1869	26,730	August 5, 1886	150,000
July 11, 1870	42,900	August 11, 1888	300,000
March 3, 1871	50,000	September 19, 1890	340,000
June 10, 1872	100,000	March 3, 1891	151,200
March 3, 1873	200,000	August 5, 1892	208,000
March 3, 1875	75,000		
August 14, 1876	75,000	Total	3,121,030
June 18, 1878	75,000		

Money statement.

July 1, 1892, balance unexpended	$66,310.15
Amount appropriated by sundry civil act approved August 5, 1892	208,000.00
	274,310.15
June 30, 1893, amount expended during fiscal year	253,698.09
July 1, 1893, balance unexpended	20,612.06
July 1, 1893, outstanding liabilities	800.00
July 1, 1893, balance available	19,812.06
Amount that can be profitably expended in fiscal year ending June 30, 1895 Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	100,000.00

COMMERCIAL STATISTICS.

CUSTOM-HOUSE, BALTIMORE, MD.,
Collector's Office, July 21, 1893.

SIR: In accordance with the practice prevailing at this port, requiring the collector annually to render a statement of the business transactions of the port of Baltimore for information and use in your Department, I have the honor to submit the

following tabulated commercial statement for the fiscal year ended June 30, 1893, as compared with the twelve months preceding, ended June 30, 1892:

Tonnage movement.

	Foreign.		Coastwise.	
	1892.	1893.	1892.	1893.
	Tons.	*Tons.*	*Tons.*	*Tons.*
Inward	1, 123, 368	774, 399	1, 192, 137	1, 272, 868
Outward	1, 383, 935	1, 112, 456	1, 524, 602	1, 447, 453

Established steamship lines.

Name of line.	No. of vessels.	Net tons.	Destination.
North German Lloyd	10	30, 569	Bremen.
Atlantic Transport	12	26, 849	London.
Lord	6	12, 706	Belfast and Dublin.
Bristol Channel	6	7, 104	Bristol.
Empire	9	12, 508	Leith.
Johnston	7	17, 454	Liverpool.
Hamburg-American	13	26, 131	Hamburg.
Puritan	4	7, 141	Antwerp.
Donaldson Blue Cross	7	14, 076	Glasgow.
Hammonia	6	8, 894	South Brazil ports.
Blue Cross	4	6, 319	Havre.
Neptune	10	18, 633	Rotterdam.
Royal Netherlands	4	8, 174	Amsterdam.
Red Cross	4	4, 174	North Brazil ports.
Earn	11	16, 872	Cuba and West Indies.
Buckman's	5	1, 991	Port Antonio, Jamaica.
Bulack's	6	2, 484	Annatto Bay, Jamaica.
Allan	4	10, 092	Liverpool.

Eighteen lines. One new line established in 1893.

Value of imports.

1893 (free)	$7, 419, 132
1892 (free)	6, 652, 028
Increase in 1893	767, 104
1893 (dutiable)	8, 730, 980
1892 (dutiable)	6, 766, 225
Increase in 1893	1, 964, 755

Recapitulation of imports.

1893 (free)	7, 419, 132
1893 (dutiable)	8, 730, 980
Total value, 1893	16, 150, 112
Total value, 1892	13, 418, 253
Increase in 1893	2, 731, 859
Imports in American vessels, 1893:	
Sailing	3, 177, 147
Steam	45, 175
Imports in foreign vessels, 1893:	
Sailing	502, 703
Steam	12, 397, 400
Imports in cars overland, 1893	27, 687
Total imports, 1893	16, 150, 112

Value of domestic exports.

1893	$71,482,652
1892	98,796,856
Decrease in 1893	27,314,204

Exports in American vessels, 1893:	
Sailing	1,050,843
Steam	
Exports in foreign vessels, 1893:	
Sailing	109,610
Steam	70,322,199
Total exports in 1893	71,482,652

Recapitulation of exports.

In American vessels, 1893	1,050,843
In foreign vessels, 1893	70,431,809
Total, 1893	71,482,652

Certain articles exported.

Articles.	Tons.	Articles.	Tons.
Cattle	23,328	Beef (canned)	11,965
Corn	154,176	Beef (fresh)	2.530
Wheat	380,865	Beef (salt)	1,384
Flour	296.276	Tallow	6,425
Coal	136,878	Bacon	960
Copper matte	15,103	Hams	342
Copper ingots	1,498	Pickled pork	841
Cotton	49,314	Lard	15,288
Dried apples	977	Oleomargarine oil	12,089
Grape sugar	3,532	Cottonseed oil	1,754
Rosin	11,491	Starch	5,270
Oil cake	26,079	Tobacco leaf	21,592
Illuminating oil	74,404	Tobacco stems	3,125
Wax	1,235	Zinc	261

Transportation in bond with appraisement.

Destination.	Value.	Duty.	Destination.	Value.	Duty.
Chicago, Ill	$32,974	$21,958.29	Peoria, Ill	$2,813	$2,016.41
Cincinnati, Ohio	7,191	6,990.22	Philadelphia, Pa	1,047	2,528.33
Cleveland, Ohio	2,403	1,518.06	Pittsburg, Pa	36	19.20
Detroit, Mich	1,506	1,266.63	Richmond, Va	78	105.50
Georgetown, D. C	1,701	594.00	St. Louis, Mo	8,884	7,099.34
Indianapolis, Ind	12,935	11,318.08	Toledo, O	8,883	6,283.67
Key West, Fla	277	721.50	Wheeling, W. Va	1,592	497.51
Memphis, Tenn	767	502.09			
Milwaukee, Wis	5,024	3,897.22	**Total**	90,232	68,608.83
New York, N. Y	2,121	1,202.78			

Transportation in bond without appraisement.

Destination.	Value.	Bond.	Destination.	Value.	Bond.
Buffalo, N. Y	$5,033	$1,806.75	Milwaukee, Wis	$61,832	$38,829.29
Charleston, S. C	812	320.00	Minneapolis, Minn	742	445.20
Chicago, Ill	1,238,690	1,116,393.27	Nashville, Tenn	7,899	6,226.49
Cincinnati, Ohio	335,212	426,957.84	Omaha, Nebr	4,024	4,875.23
Cleveland, Ohio	157,246	99,359.95	Philadelphia, Pa	5,728	4,053.30
Columbus, Ohio	17,554	7,065.76	Pittsburg, Pa	38,157	40,247.06
Denver, Col	164	500.00	Georgetown, D. C	15,872	10,830.41
Des Moines, Iowa	626	375.60	Richmond, Va	10,260	14,357.93
Detroit, Mich	29,115	23,342.48	St. Paul, Minn	7,840	9,448.40
Dubuque, Iowa	1,897	957.00	St. Louis, Mo	543,761	461,436.89
Evansville, Ind	9,800	6,071.24	St. Joseph, Mo	11,893	8,919.02
Grand Rapids, Mich	12,036	7,300.88	Toledo, Ohio	13,494	9,048.36
Galveston, Tex	818	2,500.00	Wheeling, W. Va	834	570.16
Indianapolis, Ind	154,145	108,721.78	Wilmington, Del	1,466	1,172.80
Kansas City, Mo	23,858	19,322.59			
Louisville, Ky	190,412	437,210.47	**Total**	2,901,200	2,868,666.15

Summary of merchandise in bond without appraisement.

Year.	Value.	Bond.
1893	$2.901,200	$2,868,666.15
1892	2,219,070	1,785,425.45
Increase in 1893	782,130	1,083,240.70

Number of immigrants and passengers arrived:	
In 1893	26,183
In 1892	57,323
Decrease in 1893	31,140
Amount of dues collected in 1893	$4,555,993.67
Miscellaneous customs receipts	73,205.46
Total receipts in 1893	4,629,199.13
Total receipts in 1892	3,178,558.44
Increase in 1893	1,450,640.69
Duties on merchandise in bond:	
1893	501,297.92
1892	219,752.15
Increase, 1893	281,544.77

Summary of duties, 1893.

Duties, etc., collected	$4,629,199.13
Duties on merchandise in bond	501,297.92
Duties on merchandise in bond, with and without appraisement	2,937,274.98
Total	8,067,772.03

Vessels built.

Year.	Number.	Gross tons.	Net tons.
1893	33	4.716.35	3,338.60
1892	30	3,013.46	1,986.33
Increase, 1893	3	1,702.89	1,402.27

	Tons.
Vessels entered from foreign ports:	
American:	
Sailing	43,603
Steam	732
Foreign:	
Sailing	22,973
Steam	707,091
Total	774,399
Vessels cleared for foreign ports:	
American:	
Sailing	42,960
Steam	2,320
Foreign:	
Sailing	8,818
Steam	1,058,358
Total	1,112,456
Vessels entered	774,399
Vessels cleared	1,112,456

Total foreign, 1893	1,886,855
Total foreign, 1892	2,507,303
Decrease, 1893	620,448
Vessels entered coastwise, 1893	1,272,868
Vessels cleared coastwise, 1893	1,447,453
Total coastwise, 1893	2,720,321
Total coastwise, 1892	2,716,739
Increase, 1893	3,582

RECAPITULATION.

Total foreign tonnage, in and out, 1893	1,886,855
Total coastwise tonnage, in and out, 1893	2,720,321
Total tonnage, in and out, 1893	4,607,176
Total tonnage, in and out, 1892	5,224,042
Decrease, 1893	616,866

STATISTICAL RECAPITULATION.

Dutiable merchandise increased	$1,964,755
Free merchandise has increased	$767,104
Domestic exports have decreased	$27,314,204
Tonnage, foreign and coastwise, has decreased, tons	616,866
Increase in duties collected	$1,450,640.69
Increase in duties on merchandise in bond	$501,297.92
Increase in duties on merchandise in bond, with and without appraisement	$1,138,022.49
Increase in number of vessels built	3

The tonnage movement at this port for the fiscal year shows a decrease from the preceding year due entirely to the short shipment of grain.

There are now eighteen established steamship lines trading between this and foreign ports, an increase of one line, representing one hundred and twenty-eight steamships, an increase of thirty-seven ships, with an aggregate carrying capacity of 13,990,260 tons. The harbor and dock facilities at this port are being constantly improved, so that they are now superior to many and second to none on the Atlantic coast. Vessels of the deepest draft have easy access in and out, and the quick, cheap dispatch vessels receive here make it a favorable trading port. Our shipbuilding industry has been fairly active. Thirty-four vessels, valued at $650,000, were built, and there are now ten vessels in the course of construction.

Respectfully yours,

Wm. M. Marine,
Collector.

Col. William P. Craighill,
Corps of Engineers.

I 2.

IMPROVEMENT OF CHANNEL TO CURTIS BAY IN PATAPSCO RIVER, BALTIMORE HARBOR, MARYLAND.

The river and harbor act of 1892 contained the following item:

Improving Patapsco River, Baltimore Harbor, Maryland: For dredging a channel one hundred and fifty feet wide at bottom and of a depth of twenty-seven feet mean low water from the main ship channel to Curtis Bay, in accordance with recommendation of Colonel William P. Craighill, Corps of Engineers, submitted December thirteenth, eighteen hundred and ninety, twenty-eight thousand dollars.

The total estimated cost of the improvement was $85,000. The first appropriation of $28,000 has been expended in dredging to a depth of

25 feet at low water. The work, under a contract with the National Dredging Company, was commenced in November, 1892, and after considerable interruption by ice and severe weather was satisfactorily completed in May, 1893. The channel is made 150 feet wide.

Money statement.

Amount appropriated by act approved July 13, 1892	$28,000.00
June 30, 1893, amount expended during fiscal year	28,000.00
Amount (estimated) required for completion of existing project	57,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	57,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for dredging a channel from the main ship channel to Curtis Bay, Patapsco River, Maryland, opened by Col. William P. Craighill, Corps of Engineers, at 12:05 p. m., August 23, 1892.

No.	Name and address of bidder.	Time.		Price per cubic yard.	Total.
		Commence.	Complete.		
				Cents.	
1	Chester T. Caler, Norfolk, Va	May 15, 1893	Jan. 1, 1894	23	$57,500.00
2	Geo. C. Fobes & Co., Baltimore, Md	Jan. 1, 1893	June 1, 1893, weather permitting.	13.2	33,000.00
3	C. P. E. Burgwyn, Richmond, Va	Notification	Aug. 1, 1893	16.6	41,500.00
4	Baltimore Dredging Co., Baltimore, Md	On or about Jan. 1, 1893 weather permitting.	June 1, 1893	12.4	31,000.00
5	John H. Madison, Baltimore, Md	On or before Sept. 10, 1892.	May 30, 1893	12$\frac{1}{8}$	30,312.50
6	American Dredging Co., Philadelphia, Pa	Mar. 1, 1893	Aug. 1, 1893	13	32,500.00
7	Morris & Cumings Dredging Co., New York	On or before Sept. 15, 1892.	By or before Dec. 15, 1892.	16	40,000.00
8	Atlas Dredging Co., Wilmington, Del	Oct. 1, 1892	Dec. 31, 1892	15	37,500.00

Bids rejected for noncompliance with eight-hour law.

Abstract of proposals for dredging a channel from the Main Ship Channel to Curtis Bay, Patapsco River, Maryland, opened at 12:05 p. m., October 31, 1892.

No.	Name and address of bidder.	Time.		Price per cubic yard.	Total.
		Commence.	Complete.		
				Cents.	
1	American Dredging Co., Philadelphia, Pa	April 1, 1893	July 1, 1893	12$\frac{1}{10}$	$30,250
2	Atlas Dredging Co., Wilmington, Del	Nov. 21, 1892	Apr. 1, 1893	(*)	....
3	National Dredging Co., Wilmington, Del	Nov. 5, 1892	June 30, 1893	12	30,000

* Price left blank.

Contract with the National Dredging Company.

Abstract of proposals for dredging and constructing dikes, etc.—Continued.

No.	Name and address of bidder.	Time.		Goodes Rocks.				Richmond Bar.			
		Commence.	Complete.	Earth excavation (750 cubic yards).	Cobble (750 cubic yards).	Soft rock (3,900 cubic yards).	Solid rock (5,400 cubic yards).	Earth excavation (20,700 cubic yards).	Cobble (4,200 cubic yards).	Soft rock (1,400 cubic yards).	Solid rock (1,400 cubic yards).
								Cts.	*Cts.*		
1	Jesse P. Throckmorton, Richmond, Va.	Nov. 15, 1892	Nov. 15, 1893	.....	.....	.....	.....	.....	.....	.....	.....
2	American Dredging Co., Philadelphia, Pa.	Nov. 1, 1892	Dec. 31, 1894	$1.10	$2.05	$2.05	$8.00	50	50	$0.50	$6.00
3	C. P. E Burgwyn, Richmond, Va.	On notification.	....do	1.05	2.05	2.05	6.95	42	42	42	5.45
4	John A. Curtis, Richmond, Va.	Dec. 1, 1892	Dec. 1, 1894	30	40	80	5.50	25	30	40	5.50
5	Chester T. Caler, Norfolk, Va.	Apr 10, 1893	Dec. 31, 1894	57	57	57	.....	57	57	57	.....
6	James F. Bradley, Manchester, Va.	Oct. 15, 1892	Apr. 15, 1893	.....	.....	.....	.....	.....	.....	.....	.....
7	Mason, Hoge & Dunn, Frankfort, Ky.	....do	Oct. 15, 1894	23	41	1.21	5.69	23	41	1.21	5.69
8	James T. Vaughan, Richmond, Va.	Nov. 26, 1892	Nov. 24, 1894	80	1.45	1.38	6.05	.....	.....	.....	.....
9	C. D. Langborne, Richmond, Va.	Within 10 days.	Nov. —, 1894	45	45	45	6.00	30	30	45	6.00

No.	Name and address of bidder.	Time.		Dutch Gap (12,000 cubic yards clay).	Harrisons Bar: Earth excavation (22,000 cubic yards).	Goose Hill Flats Earth excavation (30,000 cubic yards).	Transport material: Beyond limits specified per mile (cubic yards).	Richmond Bar and Drewry Bluff: Close gap in dikes (1,073 linear feet).	Kingsland Reach: Close gap in dikes (430 linear feet).	Richmond Bar: Extend old wing dams (650 linear feet).	Richmond Bar: Construct new wing dams (220 linear feet).
		Commence.	Complete.								
				Cts.	*Cts.*	*Cts.*	*Cts.*				
1	Jesse P. Throckmorton, Richmond, Va.	Nov. 15, 1892	Nov. 15, 1893	.....	.....	.....	.....	$2.00	$2.00	$2.87	$2.87
2	American Dredging Co., Philadelphia, Pa.	Nov. 1, 1892	Dec. 31, 1894	45	19	20	2	3.00	3.00	3.90	3.20
3	C. P. E. Burgwyn, Richmond, Va.	On notification.	....do	43	18 3/10	19 7/10	1¼	2.75	2.75	3.45	3.05
4	John A. Curtis, Richmond, Va.	Dec. 1, 1892	Dec. 1, 1894	40	16	16	2½	2.00	2.00	3.00	3.00
5	Chester T. Caler, Norfolk, Va.	Apr. 10, 1893	Dec. 31, 1894	.....	19	21	3	.....	.....	.....	.....
6	James F. Bradley, Manchester, Va.	Oct. 15, 1892	Apr. 15, 1593	.....	.....	.....	.....	1.89 1.29	1.88	3.12 2.52	3.12 2.52
7	Mason, Hoge & Dunn, Frankfort, Ky.	....do	Oct. 15, 1894	33	20	20	9	3.21	3.21	4.00	3.83
8	James T. Vaughan, Richmond, Va.	Nov. 26, 1892	Nov. 24, 1894	.....	.....	.....	.....	.....	.....	.....	.....
9	C. D. Laughorne, Richmond, Va.	Within ten days.	Nov. —, 1894	40	30	30	7½	1,28	1.88	2.50	2.50

Amount (estimated) required for completion of existing project	$3,336,070.45
Amount that can be profitably expended in fiscal year ending June 30, 1895	400,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for dredging and constructing dikes and wingdams, James River, Virginia, opened September 28, 1892, at 12:05 p. m.

No.	Name and address of bidder.	Time.		Richmond to Stearnes Dike.				Stearnes Dike to Goodes Rocks.			
		Commence.	Complete.	Soft excavation (2,700 cubic yards).	Cobble (2,700 cubic yards).	Soft rock (15,700 cubic yards).	Solid rock (1,750 cubic yards).	Earth excavation (2,000 cubic yards).	Cobble (1,000 cubic yards).	Soft rock (8,500 cubic yards).	Solid rock (2,800 cubic yards).
				Cts.	*Cts.*			*Cts.*			
1	Jesse P. Throckmorton, Richmond, Va.	Nov. 15, 1892	Nov. 15, 1893	.....	.....	.....	.....	.....	.....	.....	.....
2	American Dredging Co., Philadelphia, Pa.	Nov. 1, 1892	Dec. 31, 1894	27	57½	$0.57½	$5.60	27	$0.54	$0.54	$5.60
3	C. P. E. Burgwyn, Richmond, Va.	On notification.	....do.......	25	55	55	5.45	25	51	51	5.45
4	John A. Curtis, Richmond, Va.	Dec. 1, 1892	Dec. 1, 1894	30	40	45	5.50	30	40	45	5.50
5	Chester T. Caler, Norfolk, Va.	Apr. 10, 1893	Dec. 31, 1894	57	57	57	.....	57	57	57	.....
6	James F. Bradley, Manchester, Va.	Oct. 15, 1892	Apr. 15, 1893	.....	.....	.....	.....	.....	.....	.....	.....
7	Mason, Hoge & Dunn, Frankfort, Ky.	....do.......	Oct. 15, 1894	23	41	1.21	5.69	23	41	1.21	5.69
8	James T. Vaughan, Richmond, Va.	Nov. 26, 1892	Nov. 24, 1894	39½	97	43	6.05	40	1.45	43	6.05
9	C. D. Langhorne, Richmond, Va.	Within 10 days.	Nov.—, 1894	45	45	45	6.00	45	45	45	6.00

Abstract of proposals for dredging and constructing dikes, etc.—Continued.

No.	Name and address of bidder.	Time.		Goodes Rocks.				Richmond Bar.			
		Commence.	Complete.	Earth excavation (750 cubic yards).	Cobble (750 cubic yards).	Soft rock (3,900 cubic yards).	Solid rock (5,400 cubic yards).	Earth excavation (20,700 cubic yards).	Cobble (4,200 cubic yards).	Soft rock (1,400 cubic yards).	Solid rock (1,400 cubic yards).
								Cts.	*Cts.*		
1	Jesse P. Throckmorton, Richmond, Va.	Nov. 15, 1892	Nov. 15, 1893	.....	.....	.....	.....	.....	.....	.....	.....
2	American Dredging Co., Philadelphia, Pa.	Nov. 1, 1892	Dec. 31, 1894	$1.10	$2.05	$2.05	$8.00	50	50	$0.50	$6.00
3	C. P. E Burgwyn, Richmond, Va.	On notification.	....do	1.05	2.05	2.05	6.95	42	42	42	5.45
4	John A. Curtis, Richmond, Va.	Dec. 1, 1892	Dec. 1, 1894	30	40	80	5.50	25	30	40	5.50
5	Chester T. Caler, Norfolk, Va.	Apr 10, 1893	Dec. 31, 1894	57	57	57	.....	57	57	57	.....
6	James F. Bradley, Manchester, Va.	Oct. 15, 1892	Apr. 15, 1893	.....	.....	.....	.....	.....	.....	.....	.....
7	Mason, Hoge & Dunn, Frankfort, Ky.	....do	Oct. 15, 1894	23	41	1.21	5.69	23	41	1.21	5.69
8	James T. Vaughan, Richmond, Va.	Nov. 26, 1892	Nov. 24, 1894	80	1.45	1.38	6.05	.....	.....	.....	.....
9	C. D. Langhorne, Richmond, Va.	Within 10 days.	Nov. —, 1894	45	45	45	6.00	30	30	45	6.00

No.	Name and address of bidder.	Time.		Dutch Gap (12,000 cubic yards clay).	Harrisons Bar: Earth excavation (22,000 cubic yards).	Goose Hill Flats Earth excavation (30,000 cubic yards).	Transport material: Beyond limits specified per mile (cubic yards).	Richmond Bar and Drewry Bluff: Close gap in dikes (1,073 linear feet).	Kingsland Reach: Close gap in dikes (430 linear feet).	Richmond Bar: Extend old wing dams (650 linear feet).	Richmond Bar: Construct new wing dams (220 linear feet).
		Commence.	Complete.								
				Cts.	*Cts.*	*Cts.*	*Cts.*				
1	Jesse P. Throckmorton, Richmond, Va.	Nov. 15, 1892	Nov. 15, 1893	.....	.....	.....	.....	$2.00	$2.00	$2.87	$2.87
2	American Dredging Co., Philadelphia, Pa.	Nov. 1, 1892	Dec. 31, 1894	45	19	20	2	3.00	3.00	3.90	3.20
3	C. P. E. Burgwyn, Richmond, Va.	On notification.	....do	43	18$\frac{3}{10}$	19$\frac{3}{10}$	1¼	2.75	2.75	3.45	3.05
4	John A. Curtis, Richmond, Va.	Dec. 1, 1892	Dec. 1, 1894	40	16	16	2½	2.00	2.00	3.00	3.00
5	Chester T. Caler, Norfolk, Va.	Apr. 10, 1893	Dec. 31, 1894	.....	19	21	3	.....	.....	.....	.....
6	James F. Bradley, Manchester, Va.	Oct. 15, 1892	Apr. 15, 1893	.....	.....	.....	.....	1.89 1.29	1.88	3.12 2.52	3.12 2.52
7	Mason, Hoge & Dunn, Frankfort, Ky.	....do	Oct. 15, 1894	33	20	20	9	3.21	3.21	4.00	3.33
8	James T. Vaughan, Richmond, Va.	Nov. 26, 1892	Nov. 24, 1894	.....	.....	.....	.....	.....	.....	.....	.....
9	C. D. Langhorne, Richmond, Va.	Within ten days.	Nov. —, 1894	40	30	30	7½	1.28	1.88	2.50	2.50

By advertisement of September 30, 1890, proposals were invited for completing the channel to a width of 600 feet, with a depth of 27 feet at mean low water, which were received December 2. The contract was awarded to the American Dredging Company of Philadelphia, at 10½ cents per cubic yard for removal and redeposit, to cover 6,000,000 cubic yards of material. The time for completion of the work was June 1, 1893, but it was finished in December, 1892.

Work under the contract began February 17, 1891, and was continued vigorously, except when prevented by bad weather, until December 6, 1892, when it was completed. The channel is now 27 feet deep at mean low water, with a width throughout of not less than 600 feet, and more at the turns.

There have been excavated during the fiscal year the following amounts of material:

	Cubic yards.
From Fort McHenry division	676,371
From Brewerton division	21,509
From Cutoff division	575,838
From Lower division	92,775
Total amount removed during the fiscal year	1,366,493
Redeposited below Rock Point	290,093
Redeposited eastward of Lower division	1,076,400
Total removed under this contract:	
In year ending June 30, 1891	1,334,536
In year ending June 30, 1892	3,518,150
In year ending June 30, 1893	1,366,493
	6,219,179

FORT M'HENRY DIVISION.

The areas excavated in this division during the fiscal year were: On southwest side of channel, 10,820 by 55 feet, 36,460 by 50 feet, 1,225 by 45 feet, 2,510 by 40 feet, 3,828 by 25 feet, and 6,163 by 20 feet, or a total area on southwest side of 310,286 square yards; on northeast side of channel the areas excavated were: 4,500 by 50 feet, 1,380 by 45 feet, and 1,335 by 20 feet, or a total area on northeast side of 34,866 square yards.

BREWERTON DIVISION.

The area excavated in this division was 4,055 by 40 feet, being removal of deposits within the 400-foot channel limits.

CUTOFF DIVISION.

The areas excavated in this division were: On southwest side 5,475 by 50 feet, 2,440 by 66⅔ feet, 112 by 33⅓ feet, and 22,140 by 45 feet, or a total area on southwest side of 160,716 square yards. There was also excavated in this division an area of about 90,000 square yards within the limits of the 400-foot channel.

LOWER DIVISION.

On the east side of this division there was excavated an area of 6,560 by 50 feet; in addition to this an area of about 92,000 square yards was excavated within the limits of the 400-foot channel. All excavations mentioned are to a depth of 27 feet at mean low water.

The *Fort McHenry division*, extending from the city limits of Balti-

more to the upper end of the Brewerton division, is 28,500 feet long, with a minimum width of 600 feet, and at its upper end, for a distance of about 6,500 feet, its width is 800 feet.

Brewerton division.—This division extends from the lower end of the Fort McHenry division to the upper end of the Cutoff division; it is 23,500 feet in length and 600 feet in width.

Cutoff division.—This division is 23,100 feet in length, with a minimum width of 600 feet. It extends from the lower end of the Brewerton to the Lower division.

Lower division.—This extends from the Cutoff division to deep water of the Chesapeake Bay; it is 2,400 feet long and 600 feet wide.

Angles.—At the junctions of the Fort McHenry and Brewerton and of the Brewerton and Cutoff divisions the maximum width is 1,000 feet, and at the junction of the Cutoff and Lower divisions the maximum width is 1,250 feet.

A resurvey is in progress of the whole area covered by the channel and to the shores on either side.

It should not be forgotten that this channel, like all artificial highways, needs attention and repairs to keep it in proper order, and the amount of repairs and consequent cost will increase rapidly if not promptly attended to at the proper times, which is *once every year.*

The following are the amounts and dates of appropriations for improving harbor at Baltimore, Md., including Patapsco River:

August 30, 1852	$20,000
August 15, 1856	100,000
June 23, 1866	5,200
March 2, 1867	75,000
July 25, 1868	17,000
April 10, 1869	26,730
July 11, 1870	42,900
March 3, 1871	50,000
June 10, 1872	100,000
March 3, 1873	200,000
March 3, 1875	75,000
August 14, 1876	75,000
June 18, 1878	75,000
March 3, 1879	$160,000
June 14, 1880	100,000
March 3, 1881	150,000
August 2, 1882	450,000
July 5, 1884	250,000
August 5, 1886	150,000
August 11, 1888	300,000
September 19, 1890	340,000
March 3, 1891	151,200
August 5, 1892	208,000
Total	3,121,030

Money statement.

July 1, 1892, balance unexpended	$66,310.15
Amount appropriated by sundry civil act approved August 5, 1892	208,000.00
	274,310.15
June 30, 1893, amount expended during fiscal year	253,698.09
July 1, 1893, balance unexpended	20,612.06
July 1, 1893, outstanding liabilities	800.00
July 1, 1893, balance available	19,812.06
Amount that can be profitably expended in fiscal year ending June 30, 1895 Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	100,000.00

COMMERCIAL STATISTICS.

CUSTOM-HOUSE, BALTIMORE, MD.,
Collector's Office, July 21, 1893.

SIR: In accordance with the practice prevailing at this port, requiring the collector annually to render a statement of the business transactions of the port of Baltimore for information and use in your Department, I have the honor to submit the

By advertisement of September 30, 1890, proposals were invited for completing the channel to a width of 600 feet, with a depth of 27 feet at mean low water, which were received December 2. The contract was awarded to the American Dredging Company of Philadelphia, at 10½ cents per cubic yard for removal and redeposit, to cover 6,000,000 cubic yards of material. The time for completion of the work was June 1, 1893, but it was finished in December, 1892.

Work under the contract began February 17, 1891, and was continued vigorously, except when prevented by bad weather, until December 6, 1892, when it was completed. The channel is now 27 feet deep at mean low water, with a width throughout of not less than 600 feet, and more at the turns.

There have been excavated during the fiscal year the following amounts of material:

	Cubic yards.
From Fort McHenry division	676,371
From Brewerton division	21,509
From Cutoff division	575,838
From Lower division	92,775
Total amount removed during the fiscal year	1,366,493
Redeposited below Rock Point	290,093
Redeposited eastward of Lower division	1,076,400
Total removed under this contract:	
In year ending June 30, 1891	1,334,536
In year ending June 30, 1892	3,518,150
In year ending June 30, 1893	1,366,493
	6,219,179

FORT M'HENRY DIVISION.

The areas excavated in this division during the fiscal year were: On southwest side of channel, 10,820 by 55 feet, 36,460 by 50 feet, 1,225 by 45 feet, 2,510 by 40 feet, 3,828 by 25 feet, and 6,163 by 20 feet, or a total area on southwest side of 310,286 square yards; on northeast side of channel the areas excavated were: 4,500 by 50 feet, 1,380 by 45 feet, and 1,335 by 20 feet, or a total area on northeast side of 34,866 square yards.

BREWERTON DIVISION.

The area excavated in this division was 4,055 by 40 feet, being removal of deposits within the 400-foot channel limits.

CUTOFF DIVISION.

The areas excavated in this division were: On southwest side 5,475 by 50 feet, 2,440 by 66⅔ feet, 112 by 33⅓ feet, and 22,140 by 45 feet, or a total area on southwest side of 160,716 square yards. There was also excavated in this division an area of about 90,000 square yards within the limits of the 400-foot channel.

LOWER DIVISION.

On the east side of this division there was excavated an area of 6,560 by 50 feet; in addition to this an area of about 92,000 square yards was excavated within the limits of the 400-foot channel. All excavations mentioned are to a depth of 27 feet at mean low water.

The *Fort McHenry division*, extending from the city limits of Balti-

more to the upper end of the Brewerton division, is 28,500 feet long, with a minimum width of 600 feet, and at its upper end, for a distance of about 6,500 feet, its width is 800 feet.

Brewerton division.—This division extends from the lower end of the Fort McHenry division to the upper end of the Cutoff division; it is 23,500 feet in length and 600 feet in width.

Cutoff division.—This division is 23,100 feet in length, with a minimum width of 600 feet. It extends from the lower end of the Brewerton to the Lower division.

Lower division.—This extends from the Cutoff division to deep water of the Chesapeake Bay; it is 2,400 feet long and 600 feet wide.

Angles.—At the junctions of the Fort McHenry and Brewerton and of the Brewerton and Cutoff divisions the maximum width is 1,000 feet, and at the junction of the Cutoff and Lower divisions the maximum width is 1,250 feet.

A resurvey is in progress of the whole area covered by the channel and to the shores on either side.

It should not be forgotten that this channel, like all artificial highways, needs attention and repairs to keep it in proper order, and the amount of repairs and consequent cost will increase rapidly if not promptly attended to at the proper times, which is *once every year.*

The following are the amounts and dates of appropriations for improving harbor at Baltimore, Md., including Patapsco River:

August 30, 1852	$20,000	March 3, 1879	$160,000
August 15, 1856	100,000	June 14, 1880	100,000
June 23, 1866	5,200	March 3. 1881	150,000
March 2, 1867	75,000	August 2, 1882	450,000
July 25, 1868	17,000	July 5, 1884	250,000
April 10, 1869	26,730	August 5, 1886	150,000
July 11, 1870	42,900	August 11, 1888	300,000
March 3, 1871	50,000	September 19, 1890	340,000
June 10, 1872	100,000	March 3, 1891	151,200
March 3, 1873	200,000	August 5, 1892	208,000
March 3, 1875	75,000		
August 14, 1876	75,000	Total	3,121,030
June 18, 1878	75,000		

Money statement.

July 1, 1892, balance unexpended	$66,310.15
Amount appropriated by sundry civil act approved August 5, 1892	208,000.00
	274,310.15
June 30, 1893, amount expended during fiscal year	253,698.09
July 1, 1893, balance unexpended	20,612.06
July 1, 1893, outstanding liabilities	800.00
July 1, 1893, balance available	19,812.06
Amount that can be profitably expended in fiscal year ending June 30, 1895	100,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

COMMERCIAL STATISTICS.

CUSTOM-HOUSE, BALTIMORE, MD.,
Collector's Office, July 21, 1893.

SIR: In accordance with the practice prevailing at this port, requiring the collector annually to render a statement of the business transactions of the port of Baltimore for information and use in your Department, I have the honor to submit the

Amount (estimated) required for completion of existing project.....$3,336,070.45
Amount that can be profitably expended in fiscal year ending June 30, 1895.......... 400,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for dredging and constructing dikes and wingdams, James River, Virginia, opened September 28, 1892, at 12:05 p. m.

No.	Name and address of bidder.	Time.		Richmond to Stearnes Dike.				Stearnes Dike to Goodes Rocks.			
		Commence.	Complete.	Soft excavation (2,700 cubic yards).	Cobble (2,700 cubic yards).	Soft rock (15,700 cubic yards).	Solid rock (1,750 cubic yards).	Earth excavation (2,000 cubic yards).	Cobble (1,000 cubic yards).	Soft rock (8,500 cubic yards).	Solid rock (2,800 cubic yards).
				Cts.	*Cts.*			*Cts.*			
1	Jesse P. Throckmorton, Richmond, Va.	Nov. 15, 1892	Nov. 15, 1893	.....	.....	.....	.....	.....	.....	.....	.....
2	American Dredging Co., Philadelphia, Pa.	Nov. 1, 1892	Dec. 31, 1894	27	57½	$0.57½	$5.60	27	$0.54	$0.54	$5.60
3	C. P. E. Burgwyn, Richmond, Va.	On notification.	....do	25	55	55	5.45	25	51	51	5.45
4	John A. Curtis, Richmond, Va.	Dec. 1, 1892	Dec. 1, 1894	30	40	45	5.50	30	40	45	5.50
5	Chester T. Caler, Norfolk, Va.	Apr. 10, 1893	Dec. 31, 1894	57	57	57	.....	57	57	57	.....
6	James F. Bradley, Manchester, Va.	Oct. 15, 1892	Apr. 15, 1893	.....	.....	.....	.....	.....	.....	.....	.....
7	Mason, Hoge & Dunn, Frankfort, Ky.	....do	Oct. 15, 1894	23	41	1.21	5.69	23	41	1.21	5.69
8	James T. Vaughan, Richmond, Va.	Nov. 26, 1892	Nov. 24, 1894	39½	97	43	6.05	40	1.45	43	6.05
9	C. D. Langhorne, Richmond, Va.	Within 10 days.	Nov.—, 1894	45	45	45	6.00	45	45	45	6.00

Abstract of proposals for dredging and constructing dikes, etc.—Continued.

No.	Name and address of bidder.	Time.		Goodes Rocks.				Richmond Bar.			
		Commence.	Complete.	Earth excavation (750 cubic yards).	Cobble (750 cubic yards).	Soft rock (3,900 cubic yards).	Solid rock (5,400 cubic yards).	Earth excavation (20,700 cubic yards).	Cobble (4,200 cubic yards).	Soft rock (1,400 cubic yards).	Solid rock (1,400 cubic yards).
								Cts.	*Cts.*		
1	Jesse P. Throckmorton, Richmond, Va.	Nov. 15, 1892	Nov. 15, 1893	.....	.....	.....	.....	.....	.....	.....	.....
2	American Dredging Co., Philadelphia, Pa.	Nov. 1, 1892	Dec. 31, 1894	$1.10	$2.05	$2.05	$8.00	50	50	$0.50	$6.00
3	C. P. E Burgwyn, Richmond, Va.	On notification.	....do	1.05	2.05	2.05	6.95	42	42	42	5.45
4	John A. Curtis, Richmond, Va.	Dec. 1, 1892	Dec. 1, 1894	30	40	80	5.50	25	30	40	5.50
5	Chester T. Caler, Norfolk, Va.	Apr 10, 1893	Dec. 31, 1894	57	57	57	.....	57	57	57	.....
6	James F. Bradley, Manchester, Va.	Oct. 15, 1892	Apr. 15, 1893	.....	.....	.....	.....	.....	.....	.....	.....
7	Mason, Hoge & Dunn, Frankfort, Ky.	....do	Oct. 15, 1894	23	41	1.21	5.69	23	41	1.21	5.69
8	James T. Vaughan, Richmond, Va.	Nov. 26, 1892	Nov. 24, 1894	80	1.45	1.38	6.05	.....	.....	.....	.....
9	C. D. Langhorne, Richmond, Va.	Within 10 days.	Nov. —, 1894	45	45	45	6.00	30	30	45	6.00

No.	Name and address of bidder.	Time.		Dutch Gap (12,000 cubic yards clay).	Harrisons Bar: Earth excavation (22,000 cubic yards).	Goose Hill Flats Earth excavation (30,000 cubic yards).	Transport material: Beyond limits specified per mile (cubic yards).	Richmond Bar and Drewry Bluff: Close gap in dikes (1,073 linear feet).	Kingsland Reach: Close gap in dikes (430 linear feet).	Richmond Bar: Extend old wing dams (650 linear feet).	Richmond Bar: Construct new wing dams (220 linear feet).
		Commence.	Complete.								
				Cts.	*Cts.*	*Cts.*	*Cts.*				
1	Jesse P. Throckmorton, Richmond, Va.	Nov. 15, 1892	Nov. 15, 1893	.....	.....	.....	.....	$2.00	$2.00	$2.87	$2.87
2	American Dredging Co., Philadelphia, Pa.	Nov. 1, 1892	Dec. 31, 1894	45	19	20	2	3.00	3.00	3.90	3.20
3	C. P. E. Burgwyn, Richmond, Va.	On notification.	....do	43	18 3/10	19 2/10	1¼	2.75	2.75	3.45	3.05
4	John A. Curtis, Richmond, Va.	Dec. 1, 1892	Dec. 1, 1894	40	16	16	2½	2.00	2.00	3.00	3.00
5	Chester T. Caler, Norfolk, Va.	Apr. 10, 1893	Dec. 31, 1894	.....	19	21	3	.....	.....	.....	.....
6	James F. Bradley, Manchester, Va.	Oct. 15, 1892	Apr. 15, 1893	.....	.....	.....	.....	1.89 1.29	1.88	3.12 2.52	3.12 2.52
7	Mason, Hoge & Dunn, Frankfort, Ky.	....do	Oct. 15, 1894	33	20	20	9	3.21	3.21	4.00	3.33
8	James T. Vaughan, Richmond, Va.	Nov. 26, 1892	Nov. 24, 1894	.....	.....	.....	.....	.....	.....	.....	.....
9	C. D. Langhorne, Richmond, Va.	Within ten days.	Nov. —, 1894	40	30	30	7½	1.28	1.88	2.50	2.50

Abstract of proposals for dredging and constructing dikes, etc.—Continued.

No.	Name and address of bidder.	Time.		Richmond Bar to Drewry Bluff: Extend old wing dams (1,272 linear feet).	Richmond Bar to Drewry Bluff: Construct new wing dams (408 linear feet).	Wards Reach: Construct new wing dams (985 linear feet).	Willis Reach: Construct new wing dams (1,000 linear feet).	Varina Reach: Extend old wing dams (180 linear feet).	Varnia Reach: Construct new wing dams (1,750 linear feet).	Curles: Construct new wing dams (2,875 linear feet).
		Commence.	Complete.							
1	Jesse P. Throckmorton, Richmond, Va.	Nov. 15, 1892	Nov. 15, 1893	$2.87	$2.87	$2.87	$2.87	$2.87	$2.87	$2.87
2	American Dredging Co., Philadelphia, Pa.	Nov. 1, 1892	Dec. 31, 1894	3.90	3.20	3.20	3.20	3.90	3.20	3.20
3	C. P. E. Burgwyn, Richmond, Va.	On notification.	....do	3.45	3.05	3.05	3.05	3.45	3.05	3.05
4	John A. Curtis, Richmond, Va.	Dec. 1, 1892	Dec. 1, 1894	3.00	3.00	3.00	3.00	3.00	3.00	3.00
5	Chester T. Caler, Norfolk, Va.	Apr. 10, 1893	Dec. 31, 1894	......	......	......	......	......	......	......
6	James F. Bradley, Manchester, Va.	Oct. 15, 1892	Apr. 15, 1893	3.12 2.52	3.12 2.52	3.00	3.00	3.00	3.00	3.00
7	Mason, Hoge & Dunn, Frankfort, Ky.	....do	Oct. 15, 1894	4.00	3.33	3.33	3.33	4.00	3.33	3.33
8	James T. Vaughan, Richmond, Va.	Nov. 26, 1892	Nov. 24, 1894	......	......	......	......	......	......	......
9	C. D. Langhorne, Richmond, Va.	Within ten days.	Nov. —, 1894	2.50	2.50	2.95	2.95	2.95	2.95	2.95

No.	Name and address of bidder.	Time.		Construct crib wing dams (linear foot).	Total.	Remarks.
		Commence.	Complete.			
1	Jesse P. Throckmorton, Richmond, Va.	Nov. 15, 1892	Nov. 15, 1893	$0.33	....	Cubic foot.
2	American Dredging Co., Philadelphia, Pa.	Nov. 1, 1892	Dec. 31, 1894	......	$178,664.90	Wants all the work or none.
3	C. P. E. Burgwyn, Richmond, Va.	On notification.	....do	21	164,086.55	Cubic foot; wants all the work or modification.
4	John A. Curtis, Richmond, Va.	Dec. 1, 1892	Dec. 1, 1894	50	137,061.00	Wants all the work or none.
	Chester T. Caler, Norfolk, Va.	Apr. 10, 1893	Dec. 31, 1894	......	....	
6	James F. Bradley, Manchester, Va.	Oct. 15, 1892	Apr. 15, 1893	2.73 2.13	....	Cubic yard. Cubic yard if gravel is furnished.
7	Mason, Hoge & Dunn, Frankfort, Ky.	....do	Oct. 15, 1894	5.00	171,685.67	Wants all the excavation or none. Care nothing for the timber work.
8	James T. Vaughan, Richmond, Va.	Nov. 26, 1892	Nov. 24, 1894	......	....	
9	C. D. Langhorne, Richmond, Va.	Within ten days.	Nov. —, 1894	2.10	148,497.84	Cubic yard.

Contract with John A. Curtis.

Abstract of proposals for building one scow, improving James River, Virginia, opened December 28, 1892, at 12.05 p. m.

No.	Name and address of bidder.	Time.		Price.
		Commence.	Complete.	
1	George Washington Donly, Richmond, Va	Jan. 15, 1893	Apr. 1, 1893	$1,074.00
2	William E. Woodall & Co., Baltimore, Md	At once	....do	2,500.00
3	The James Clark Company, Baltimore, Md	Award of contract	....do	1,950.00
4	Lewis H. Hoagland, Portsmouth, Va	10 days	....do	1,240.00
5	Wilson Reed, Norfolk, Va	Jan. 10, 1893	....do	1,980.00
6	Louis H. Skinner, Wilmington, N. C	Jan. 25, 1893	Feb. 25, 1893	1,300.00
7	H. T. Morrison & Co., Petersburg, Va	Feb. 1, 1893	Apr. 1, 1893	1,157.67
8	John F. Walsh, jr., New York, N. Y		....do	2,432.00
9	The Brusstar Shipbuilding Company, Baltimore, Md	At once	....do	971.50

Contract with the Brusstar Shipbuilding Company.

REPORT OF MR. H. D. WHITCOMB, ASSISTANT ENGINEER.

RICHMOND, VA., *July 1, 1893.*

Colonel: I have the honor to submit the following report of operations connected with the improvement of James River, Virginia, for the fiscal year ending June 30, 1893.

Surveys and tidal observations.—A survey of the bend cut-off at Dutch Gap was made in July, 1892, and a map giving the soundings in the bend, and a report on the conditions of the bend and island was afterward submitted to you.

A resurvey of the river from the Chesapeake and Ohio Railway wharves near Richmond to Drewry Bluff was made October and November, 1892, which included a renewal of a part of the triangulation and plane-table work for the whole distance. The soundings were taken at frequent intervals from a graduated wire stretched across the river. The maps of this work are completed on a scale of 1 inch to 100 feet, and the changes which have resulted from the works of improvement and from freshets and other causes since 1874, when the first survey under your direction was made, can be seen by a comparison of the maps.

In addition to former data the contours to 40 feet above low tide are shown, the most of which were copied from maps furnished by the U. S. Coast Survey office.

Soundings were also taken after the freshet of May, 1893, between the wing dams from Richmond Bar to Drewry Bluff, and in lines 50 feet apart between the works of regulation on the shoal in Kingsland Reach.

The two registering tide gauges were put in serviceable condition. One was put in operation near the lower city limits in December, but was removed on account of ice in the river at the close of the month, and not restored until March. The delay in beginning these observations and the interruptions since have been so great that they are unimportant by themselves and are not reported at this time.

The second gauge is intended to be placed at Dutch Gap, but there has been no opportunity for constructing a suitable stand for it as yet.

New property scow.—A new scow, 60 by 20 feet on deck, built by contract in Baltimore, to hold property of the United States used on the improvement, was delivered here April 3, 1893, and has taken the place of one heretofore used and now condemned.

Freshets.—There have been but three rises in the river worthy of record, which were as follows: February 14, 1893, 9.3 feet above datum or mean low tide; February 19, 1893, 8.7 feet above datum or mean low tide; May 5, 1893, 16.9 feet above datum or mean low tide. The latter was the highest rise since August 2, 1889.

Ice.—The river was closed by ice and navigation suspended January 10, 1893. It remained so until the 30th, when the steam tug *Olive Branch* cut her way from City Point and navigation was resumed a few days later. The tug was so injured by the ice, which was 8 inches thick on the channel, that she sunk a few hours after her arrival.

All portable articles belonging to the United States were removed from the property scow and other points likely to be reached by an ice freshet, but the ice disappeared without any considerable rise in the river or appreciable damage to property or the works.

Dredging and other work.—At the beginning of the year Mr. C. D. Langhorne was completing his contract, approved December 23, 1890, and modified by a supplemental agreement approved March 26, 1892. His operations were confined to enlarging the channel between the upper Chesapeake and Ohio Railway Wharf and

Goodes Rocks, and to not less than 60 feet in width and 18 feet depth; the completion of an additional 30 feet in width through the Goodes Rocks Cut, and the removal of some of the remaining parts of the obstruction placed on Warwick Bar during the civil war.* The limit of expenditure allowed by his contract was reached November 12, 1892.

Under this contract there were removed between July 1 and November 12, 1892, 16,786 cubic yards of disintegrated rock and 1,910.9 cubic yards of solid rock from the channel above Goodes Rocks; 944.8 cubic yards of solid rock from Goodes Rocks Cut, and 2,909.9 cubic yards of sand, 437.2 cubic yards of loose stone, and some timber from Warwick Bar. Under the provisions of the contract the United States were to drill and blast any rock in the channel above Goodes Rocks which could not be removed by dredges without blasting.. To carry out this provision a force was employed by the day, using the United States plant, with one additional drill rented from the contractor. The services of a steam tug, when needed, was rented by the hour. This force drilled and blasted a surface of 16,000 square feet where it averaged perhaps 2 feet above the depth required at present (18 feet) but the blasting was carried to 22 feet, or the depth of the completed project. The amount expended, which does not include interest and depreciation, was $2,488.64.

The amount of rock, soft and hard, afterwards dredged by the contractor to 18 feet was 3,055.8 cubic yards, measured on lighters by displacement. Estimating the solid rock alone, which was 1,820 cubic yards, the cost of drilling and blasting was $1.37, and of dredging it by contract afterward, $1.10—a total of $2.47 a cubic yard. The rock was not a solid mass, but in alternate layers of soft and hard, varying in thickness, the latter sometimes 3 feet thick. Owing to the limitation of expenditure under this contract some areas were left in the 60-foot channel with less than 18 feet on them, but none, it is believed, with less than 17 feet.

The cut at Goodes Rocks made under the contract of 1890, is 30 feet wide, adjoining a previous cut of 25 feet. A sweep was run over both cuts in October, 1892. No point was found in the 30-foot cut less than 19 feet below datum; and but few points with less than 20 feet. In the older cut, which was begun 180 feet lower downstream, there were points with less than 18 feet, several of which were removed; and in the 180 feet mentioned, the surface was generally less than 18 feet, with one point 15½ feet. This part has never been blasted and perhaps never thoroughly dredged. The larger part of the whole cut is of the full depth of 22 feet. It is now 55 feet wide, but has not been opened to navigation. By the contract in force it is to be made 80 feet wide. It will be difficult to make it wider than that without encroaching on the channel now used, and it is not unlikely that the old channel must be widened at a few points to the present available depth of 13.8 feet, so that vessels can have a safe clearance during the operations now in progress. Until this new channel is opened no greater depth will be available to navigation for points above, *i. e.*, to Richmond and Manchester, the Cedar Works, the Chemical Works and the Chesapeake and Ohio Railway Wharves. When the cut is 80 feet wide and marked with buoys it can be used with safety, but perhaps not as a passing point for vessels drawing over 14 feet.

The removal of the obstruction at Warwick Bar will permit the works of regulations in the vicinity to have their proper effect. The sounding rod shows layers of stone in places, with which the cribs were filled, which it may be necessary to remove when a greater depth than 18 feet is available in the channel at all points above. The channel on this bar is now 90 feet wide, of 18 feet depth, with a maximum depth of 20½ feet.

Contract now in force.—A contract with Mr. John A. Curtis was approved October 20, 1892, which includes the following work, viz: The enlargement of the channel between Richmond city limits and Goodes Rocks to not less than 80 feet wide and 18 feet deep; the widening of Goodes Rocks Cut to 80 feet, and the channel through Richmond Bar to 80 by 18 feet; the deepening of Dutch Gap cut-off to 25 feet for 100 feet of its width; and redredging and enlarging the channels at Harrison Bar and Goose Hill Flats to 200 by 18 feet. In works of regulation, the wing dams on Richmond Bar and from Warwick Bar to Drewry Bluff are to be extended to new lines of contraction, and wing dams constructed for the first time in Wards Reach, Willis Reach and at Curles. Two of the wing dams at Varina built in 1880 and shortened by the freshet of 1886 are to be restored, and new wing dams constructed on the right bank covering the whole length of the shoal, to produce further contraction and scour out the channel 300 by 22 feet, required by the project of 1884. The openings in training walls below Richmond Bar and in Kingsland Reach are to be closed.

The contractor began work December 1, 1892, according to his contract, in dredging on Richmond Bar, and in constructing wing dams near Falling Creek. His work was suspended by ice in the river from December 27 to February 6, and for about two weeks more by high water in February and May. He has completed the

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*All measurements which would vary with the stage of the tide are referred to *mean low tide* or datum line, unless otherwise stated. *Full tide* is *mean high tide*.

larger part of earth excavation and nearly all the soft rock excavation on Richmond Bar. There is much more gravel and cobblestone found there than was estimated, and more rock which may require blasting, but no blasting has been resorted to.

Excavation on Richmond Bar was suspended the latter part of April. One dredge was taken to Goodes Rocks the 22d, and employed until May 2, in clearing off that ledge preparatory to blasting; the other of his two dredges was taken to the work between the city limits and the Chesapeake and Ohio Railway Wharves the 27th, and both dredges were employed there in May and June, and have dredged in soft rock, mainly, a cut 3,900 feet long and 20 feet wide. A few areas of rock too hard for the dredges have been uncovered, but in the main the full depth of 18 feet was excavated. The cut is an addition in width to the channel now in use. An area of hard rock on the line of his excavation, uncovered under former contracts, has been drilled and blasted 40 feet in width. The main drilling plant was taken to Goodes Rocks, June 16, where 120 feet of cutting 25 feet wide has been drilled and blasted to 22 feet depth. Nearly 11,000 cubic yards are to be removed from this ledge, about one-half of which is estimated to be solid rock.

The contractor has completed the extension of the wing dams on Richmond Bar and elsewhere above Drewry Bluff, so far as is determined on at present, and has closed the gaps in the training walls at Kingsland. He is now constructing the wing dams in Wards Reach. No work has been done under his contract below Kingsland Reach.

The work under contract is intended to open a practicable channel from Richmond city limits to Hampton Roads, not less than 18 feet deep. In rock excavation, which is confined to the first 2 miles below Richmond, the least width of channel, of this depth is to be 80 feet. At other points, except in Dutch Gap Cut off and below City Point, the improvement will be by regulation intended to produce the channel of the project adopted by Congress in 1884.

With the average force of currents, fluvial mainly for 10 miles below Richmond, and tidal as well as fluvial for points further east, a depth of at least 18 feet, of sufficient width with prudent using, may be expected within a few months after the completion of these works.

Operations below City Point will be in dredging, and the channel 200 feet wide. The cut at Dutch Gap 100 feet wide to a depth of 25 feet is in furtherance of the project to make the depth of the cut the same as that of the river bed immediately above, and ultimately remove the submerged dam now existing. The excavation will be used in revetting of wing dams at Varina and Curles. The navigable channel is now 18 feet deep, and this cut will make the channel from 150 to 350 feet wide of that depth. The work done under this contract to June 30, 1893 was as follows:

15,308.5 cubic yards of earth excavation.
1,285.9 cubic yards of cobble excavation.
16,377.9 cubic yards of soft rock excavation.
218.0 cubic yards of solid rock excavation.
2,823.5 linear feet of wing dams.
447.0 linear feet of brush training walls.

Amount excavated during the fiscal year.

[Contract with C. D. Langhorne, completed November 12, 1892.]

Locality.	Sand.	Disintegrated rock.	Solid rock.	Loose stone from obstructions.
	Cu. yds.	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*
Richmond to Goodes Rocks		16,786	1,910.9	
Goodes Rocks			944.8	
Warwick Bar	2,909.9			437.2
Total	2,909.9	16,786	2,855.7	437.2

[Contract with John A. Curtis; terminates December 1, 1894.]

Locality.	Earth.	Cobble.	Soft rock.	Solid rock.	Loose stone.
	Cu. yds.	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*
Richmond to Stearns Dike	472.9	123.8	12,264.6	142.4	
Goodes Rocks	5.0	2.3	91.4	6.5	
Richmond Bar	14,830.6	1,159.8	4,021.9	69.1	
Total	15,308.5	1,285.9	16,377.9	218.0	
Total under both contracts	18,217.5	1,285.9	33,163,9	3,073.7	437.2

Extension of wing dams, new wing dams, and training walls, completed between December 1, 1892, and June 30, 1893.

[Contract with John A. Curtis.]

Number of wing dam.	Old work extended.	Average depth of water.	Number of wing dam.	Old work extended.	Average depth of water.	Number of wing dam.	New wing dams.	Average depth of water.	Number of wing dam.	New wing dams.	Average depth of water.
	Lin. ft.	*Feet.*		*Lin. ft.*	*Feet.*		*Lin. ft.*	*Feet.*		*Lin. ft.*	*Feet.*
34	57.0	14.0	99	77.2	14.8	46¼	54.3	15.9	209	109.0	4.5
36	74.7	12.1	101	72.2	15.8	46¾	107.6	9.0	210	106.1	4.1
38	65.6	11.5	103	63.6	14.3	98	47.1	0.7	212	68.8	2.5
40	63.0	9.2	105	84.5	12.2	100	128.8	1.0	214	82.3	8.0
44	64.9	12.8	107	93.2	12.4	102	91.4	2.4	216	82.6	3.8
46½	65.2	14.5	109	86.1	13.6	104	50.7	1.9	....	....	....
85	51.7	15.0	111	65.1	13.9	106	50.2	2.5	....	....	....
87	61.3	15.5	113	26.9	15.9	108	53.5	2.1	....	....	....
89	54.5	15.3	114	39.2	12.4	110	52.5	5.2	....	....	....
91	63.0	13.0	116	55.7	15.8	112	92.1	10.3	....	....	....
93	70.0	13.4	118	56.1	16.0	....	....	....	....	....	....
95	54.0	15.0	120	47.3	18.6	....	....	....	....	....	....
....	....	....	124	39.5	15.6	....	....	....	....	....	....
97	72.2	14.2	128	22.1	10.7	....	....	....	....	....	....
....	817.1	....	....	828.7	....	....	728.2	....	....	449.5	....

447 linear feet of training wall (openings at Kingsland.)
2823.5 linear feet of wing dams, extensions, and new dams.

In the annual report of 1892 tabulated data from the successive surveys made between 1874 and 1892 were submitted, which showed the progressive improvement in the channel due to works regulating the width of the waterway. A further consideration of these data and of two surveys made since encourages the belief that the regulation in progress will establish a permanent channel of the depth required by the project, from Richmond Bar, where rock excavation ceases, to City Point, where the river becomes an estuary, without further dredging; except in Dutch Gap cut-off and other limited areas where the bed may be found too compact, or of too heavy material to be readily moved by the currents.

The works will probably need some further contraction and modification in line to maintain the full widths required by the project, but further experience is needed to determine this.

It is conceded that works of this character should be commenced at their lower ends to secure the best results, but the interests of navigation have made it necessary to expend the appropriations for this improvement where the immediate benefit would be greatest. To promote this, the upper part of the regulation, which includes Richmond and Warwick bars, Randolph Flats, and another comparatively shoal area above the deep water at Drewry Bluff, was constructed first, and the rest progressively downstream. Thus the scour from the upper part was carried over the remainder with some deposit on the lower shoals, which at times has been troublesome.

As the areas between the works approached those which existed before the contraction this scour became less. But the lower parts of the work have not been long enough in operation to have attained this condition.

The upper part on Richmond Bar was begun in 1875, and completed to the older project of 15 feet, but has not been completed for the project of 22 feet until within the past two months. The lower part near Drewry Bluff was not begun until 1891. In 1892 the areas of the upper section were 5 per cent larger than in 1874, the central section was from 1 to 5 per cent less, and the lower 10 per cent less.

Until this provisionally completed regulation has been tested for several years, and the current is relieved from carrying the extra loading due to scour between the works—that is, until the normal areas of the river have been recovered—a gradual improvement in mean depth, lessening in amount as the areas approach the limit, may be expected; but it is premature to assume that the proper lines and widths have yet been given to secure the full channel directed by law.

There is no record of well-defined bars having been left between the works by freshets for several years. Where the contraction has not been maintained, from injuries to the works or otherwise, areas dependent have become shoaler, but this has rather occurred during periods when there had been no considerable freshets, and any long period of low river has been followed by a general shoaling of limited extent on all this line of regulation.

Before the regulation was made, a channel dredged through a shoal of silt was obliterated by two or three succeeding rises in the river, and sometimes by one, with a restoration of the former area, with its depth and contour of section. Any dredging in like material between the works of regulation, unless it conforms to the contour required by the current, is in like manner obliterated, but there will be an equivalent increase in the mean depth of the section, not exceeding that of the area determined by conditions at the time.

If the area is increased beyond that by such dredging, there will be a deposit from the next freshet. But it does not follow that such areas will not be increased afterward, as those below are increased through the effects of the regulation.

The areas from which the data mentioned are taken were measured from below mean low tide, the datum line. As the areas on Richmond Bar, where this regulation was commenced, were 5 per cent more in 1892 than in 1874, and the areas on Varina Shoal, 13 miles below, are 7 per cent more than before the regulation there in 1880, it is reasonable to infer that some higher level than that of mean low tide should be taken as the proper datum line for the areas, which, it is assumed, the volume of the river has made and will maintain in this part of its course.

The history of this part of the improvement shows that the areas between the works are largely increased by great freshets, those which rise to more than 20 feet, and that such areas are afterward reduced, although several minor rises may have occured, *e. g.*: There is a stretch of river below Richmond Bar, 1¼ miles long, which included the shoal of Randolph Flats, and a reach of comparatively deep water below it. The width had been contracted by wing dams, and the current was finally confined between brush training walls in 1887–'88. No further change has been made in this part of the regulation. In 1888–'89 a succession of heavy freshets occurred. There were nine in twelve months, averaging 14.34 feet,* two of which rose to 25 and 23 feet in the last two months of that period. The resulting area was but 1 per cent less than that previous to contraction. This was followed by twenty-five small freshets ending with 1892, which averaged 10.6 feet, the highest rising to 14.2 feet. There were three surveys in the interval, each showing a decrease in areas, which in October, 1892, had receded to 96.4 per cent of 1874. Since that time three freshets have occurred, averaging 10.6 feet, but the latest, May 5, 1893, rose to 16.9 feet, the greatest since August, 1889. The soundings after this freshet show an increase in area to 97.6 per cent of 1874.

The statement below, in which this stretch of river is divided in two parts, the first including the shoal, the other the deeper reach below it, gives the widths of river and the average and range of areas at the dates mentioned.

Year.	Randolph Flats Shoal (3,340 feet).				Between Randolph Flats and Warwick Bar (3,361 feet).			
	Width.	Least area.	Greatest area.	Average area.	Width.	Least area.	Greatest area.	Average area.
	Feet.	*Sq. feet.*	*Sq. feet.*	*Sq. feet.*	*Feet.*	*Sq. feet.*	*Sq. feet.*	*Sq. feet.*
1874	955	5,670	8,091	7,176	846	6,147	8,578	7,916
1889	419	6,560	7,346	7,045	442	7,398	8,299	7,908
1892	419	6,685	7,209	6,870	442	6,979	8,140	7,604
1893	419	6,824	7,176	7,010	442	7,002	8,148	7,713

The mean depth has doubled since 1874 on the shoal and increased 80 per cent in the reach. The average area is now 97.6 per cent of 1874, while the width of surface is reduced to about one-half. The navigable channel, not less than 80 feet wide, has increased in depth on the shoal from 9.2 to 18.6 feet, and in the reach from 12.4 to 18.1 feet. The ranges of depths and areas have diminished and the effects of the regulation have been greater on the shoal.

The freshet of May 5, 1893, was at its height at 9 p. m., was at a standstill until 1 a. m. next day, and then subsided. The dredges resumed work the 10th, but the current was reported by the divers employed too strong for their operations until the 15th. The effect on the channel was beneficial. About 104,000 cubic yards were scoured from between the works, from the head of Richmond Bar to Falling Creek, a distance of nearly 4 miles. A few areas were diminished, but all these were larger than the average. Thirty-four thousand cubic yards were deposited within the works in the deep water at Drewry Bluff, and probably more below the works, but the examination did not extend over that part of the river, where for about 2 miles the depth is ample for the project. From the lower end of Richmond Bar to the deep water mentioned, the channel has 18 feet available depth as against 15.5 feet mentioned in the report of 1892, and is in better condition for navigation than ever before.

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*The average of 80 freshets, from 1876 to 1892, inclusive, was 11.33 feet.

The shoal in Kingsland Reach, 10 miles below Richmond, where the surface width was contracted by training walls in 1890-'91, and a channel dredged to 22 feet, remains in a satisfactory condition. Two openings, aggregating 430 feet, had been left in the training wall on the left side for deposition of dredged material. These weakened the current in the vicinity, and about 3,000 cubic yards of silt were deposited in the parts of the channel affected by this diversion. Below the openings there was a scour of nearly 10,000 cubic yards in about 650 feet, where this examination terminated. The openings have been closed since the freshet. This shoal has been troublesome heretofore after great freshets. The ordinary depth of water was 13 feet, but after the freshet of 1877 there were but 10 feet in the channel. The bar was then dredged to about 16 feet. After the freshet of 1886 there were but 12½ feet in the channel, and 35,000 cubic yards were dredged; yet the report of 1890, following the great freshet of 1889, states that "in October, 1889, this bar had precisely the depth as when the dredging was begun." Training walls of piles and brush were constructed in 1890-'91, and include 4,500 feet of river, but the walls are not on both sides for this distance. The length of the shoal between contours of 22 feet was 2,100 feet in 1874, the same in 1886, and 2,600 in 1890. One hundred thousand cubic yards were dredged in 1890-'91 in a channel 22 feet deep and about 200 feet wide. The crest of the shoal was compact gravel and cobble, with some bowlders at about 18 feet below datum, and too hard to be moved by the currents. The present areas on the shoal are but 90 per cent of those found previous to the contraction. The former areas would be regained by widening the channel to 300 feet, the width mentioned in the project of 1884, but some part of this area will need to be dredged.

The restoration of a levee on the right bank, and raising it above the highest flood line by materials from the enlargement of this channel, would complete the regulation of this part of the river.

By the recent survey no place was found on the shoal with less than 140 feet of 20-feet depth. The thread of the channel was from 22 to 28 feet deep.

The depths of the river at mean low tide in 1870 and 1893, in a channel not less than 80 feet wide, are as follows:

	1870.	1893.
	Feet.	Feet.
From Richmond to Richmond Bar	7.0	13.8
Over Richmond Bar	7.0	15.0
From Richmond Bar to Drewry Bluff	9.0	18.0
From Drewry Bluff to City Point*	13.0	15.5
From City Point to Hampton Roads	14.8	17.0

*Trents Reach, now avoided by Dutch Gap cut-off, had but 7 feet in 1870.

The present available depth for navigation at full tide is 18½ feet from the sea to Richmond Bar, and 16½ feet thence to the city limits of Richmond.

No work has been done on the river within the limits of the city of Richmond by the United States during the year.

Very respectfully, your obedient servant,

H. D. WHITCOMB,
Assistant Engineer.

Col. WM. P. CRAIGHILL,
Corps of Engineers, U. S. A.

COMMERCIAL STATISTICS.

[Richmond, Va., custom-house report.]

Vessels, steam and sail.

Year ending June 30—	Cleared.	Entered.	Tonnage cleared.	Tonnage entered.	Value of exports.	Value of imports.
1892	421	448	359,298	381,141	$138,756	$10,180
1893	458	496	392,185	396,595	109,269	21,096

The vessels varied in draft from 6 to 16 feet.

Shipped from other points on the river excluding Richmond.

	Tons.
Grain	4,010
Hay, shucks, etc	2,255
Railroad ties	33,651
Cord wood	113,573
Lumber	127,572
Bricks and tiles	9,000
Miscellaneous	3,264
Total	293,325

Received at other points on the river excluding Richmond.

	Tons.
Coal	1,505
Lumber	950
Fertilizers	5,799
Iron	125
Miscellaneous	5,697
Total	14,076

Shipped from Richmond.

	Tons.
Coal	15,000
Railroad ties	9,584
Cord wood	3,598
Stone	3,879
Bark	1,392
Iron	12,600
Flour	8,237
Tobacco	12,329
Miscellaneous	79,571
Total	146,190

Received at Richmond.

	Tons.
Coal	64,322
Cement, lime, and plaster	11,625
Salt	2,273
Iron	6,608
Fertilizers	23,407
Iron ore	434
Ice	30,000
Miscellaneous	71,365
Total	210,034

Totals, points on the river and Richmond.

	Tons.
Shipped:	
Coal	15,000
Railroad ties	43,235
Cord wood	117,171
Stone	3,879
Bark	1,392
Iron	12,600
Flour	8,237
Tobacco	12,329
Grain	4,010
Hay, shucks, etc	2,255
Lumber	127,572
Bricks and tiles	9,000
Miscellaneous	82,835
Total	439,515

Received:	Tons.
Coal	65,827
Cement, lime, and plaster	11,625
Salt	2,273
Iron	6,733
Fertilizers	29,206
Iron ore	434
Ice	30,000
Lumber	950
Miscellaneous	77,062
Total	224,110

I 4.

REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGERING NAVIGATION.

Wreck in Baltimore Harbor—Notice was received that the schooner *Pinafore* was sunk near Fort Carroll, in Baltimore Harbor, and was a dangerous obstruction to navigation. A buoy was promptly placed upon it by the light-house inspector. The masts were removed and some other of the upper works. Under the action of the ice and waves the schooner sunk in the mud so much that when preparations were made for her removal in the spring of 1893 it was not found necessary to disturb her.

I 5.

PRELIMINARY EXAMINATION OF SOUTH BRANCH OF PATAPSCO RIVER, FROM CRAIGHILL CHANNEL TO LIGHT STREET BRIDGE; AND OF MIDDLE BRANCH OF PATAPSCO RIVER, FROM LIGHT STREET BRIDGE TO FOOT OF EUTAW STREET, BALTIMORE, MD.

[Printed in House Ex. Doc. No. 84, Fifty-second Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 5, 1892.

SIR: I have the honor to submit the accompanying copy of report dated October 7, 1892, by Col. William P. Craighill, Corps of Eng neers, concerning preliminary examination of South Branch of Patapsco River at Baltimore, Md., from Craighill Channel to Light Stree Bridge, and Middle Branch of Patapsco River from Light Street Bridg to foot of Eutaw street, provided for by the river and harbor act approved July 13, 1892.

It is the opinion of Col. Craighill, concurred in by this office, that thes localities are worthy of improvement by the General Government.

The local engineer states that no new survey is needed for the prep ration of project and estimate of cost of improvement proposed.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

Hon. S. B. ELKINS,
Secretary of War.

REPORT OF COL. WM. P. CRAIGHILL, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Baltimore, Md., October 7, 1892.

GENERAL: In obedience to your instructions I have the honor to make the following report concerning the South Branch of Patapsco River, at Baltimore, Md., from Craighill Channel to Light Street Bridge; and Middle Branch of Patapsco River, Md., from Light Street Bridge to foot of Eutaw Street.

The growth of the city of Baltimore in the last fifteen or twenty years has caused such a development in the business of the section which is interested in those portions of the Patapsco River as to justify me in saying in the words of the law that they "are worthy of improvement by the General Government."

"The facts and reasons" on which this opinion is based are personal examination of the streams and their surroundings and conference with intelligent men engaged in business there.

The principal interests to be subserved by the improvement desired are those dependent on easy navigation for ships engaged in transporting coal, wood, ice, marble, and the materials for the manufacture of glass and fertilizers. The present commerce is hampered by the want of greater depth of water, and the indications are good that there would be a decided increase of business if the existing channels were improved.

No estimate is now submitted of the amount that will enable me to make "a survey and report including a project with estimate of the cost of the improvement proposed," as no further survey is needed. Existing maps are sufficient for the preparation of a project and estimate.

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Very respectfully, your obedient servant,

WM. P. CRAIGHILL,
Colonel, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

APPENDIX J.

IMPROVEMENT OF POTOMAC RIVER AND ITS TRIBUTARIES, AND OF CERTAIN RIVERS IN MARYLAND AND VIRGINIA ON WESTERN SHORE OF CHESAPEAKE BAY.

REPORT OF MAJ. CHAS. E. L. B. DAVIS, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1893, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Potomac River and Anacostia River at Washington, D. C.
2. Occoquan Creek, Virginia.
3. Aquia Creek, Virginia.
4. Lower Machodoc Creek, Virginia.
5. Nomini Creek, Virginia.
6. Patuxent River, Maryland.
7. Rappahannock River, Virginia.
8. Urbana Creek, Virginia.
9. York River, Virginia.
10. Mattaponi River, Virginia.
11. Pamunkey River, Virginia.

EXAMINATIONS.

12. Mouth of Parish Creek, Maryland.
13. Wicomico River, Maryland.
14. Mouth of Little Wicomico River, Virginia.
15. Mouth of Morattico Creek, Virginia.
16. Mouth of Milford Haven, Virginia.

UNITED STATES ENGINEER OFFICE,
Washington, D. C., July 10, 1893.

GENERAL: I have the honor to forward herewith my annual reports for the year ending June 30, 1893, on river and harbor works in my charge.

Very respectfully, your obedient servant,

CHAS. E. L. B. DAVIS,
Major, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

J 1.

IMPROVEMENT OF POTOMAC RIVER AND ANACOSTIA RIVER AT WASHINGTON, D. C.

ORIGINAL CONDITION.

Previous to the commencement of this improvement the channel at Georgetown, D. C., was narrow and crooked, so that vessels drawing 16 feet of water often grounded above Long Bridge, and frequent dredging became necessary to maintain even this depth. On account

of the small appropriations made, only narrow cuts could be dredge
which were entirely inadequate to the needs of commerce. The Was
ington Channel was also narrow and shoal.

From Observatory Hill to a point off the Arsenal, wide flats ha
formed, partly separated from the main land below Long Bridge b
the Washington Channel, with its sluggish currents, due to the eb
and flow of tides. These flats were alternately covered and expose
to the sun's rays by the tide, whose average rise and fall at Washin
ton is 3 feet, while the large sewer at the foot of Seventeenth stre
NW. discharged directly upon them.

These conditions combined to generate an effluvium that became a
intolerable nuisance, rendering certain portions of the city almost u
inhabitable, and greatly endangering the health of the city.

PLAN OF IMPROVEMENT.

The proposed plan of improvement adopted by the act of Congre
of August 2, 1882, has for its object the improvement of the navig
tion of the river by widening and deepening its channels, the reclam
tion of the flats by depositing on them the material dredged from th
channels; the purification of the water in the Washington Chann
and the establishment of harbor lines beyond which no wharves o
obstructions shall be built.

To accomplish these purposes such depths of channels are to be pr
vided as will accommodate the largest vessels that can reach Arsen
Point, with such depths at the wharves as will allow vessels to recei
full cargoes without grounding at low water; the flats above Lon
Bridge are to be filled in to a height of 3 feet above the flood line
1877; below Long Bridge the middle line of the flats is to be filled u
to the same height, but the flats are to slope each way to a height
6 feet above low tide at the margin of the fill. In order to purify th
water in the Washington Channel, cut off at its upper end from th
Virginia or Main Channel, a tidal reservoir or basin is to be establishe
above Long Bridge, to be filled with water from the Virginia Chann
on the flood tide, and discharged into the Washington Channel o
the ebb.

The project also provides for the rebuilding of the Long Bridge at a
early period during the progress of the improvements, with wide spa
upon piers offering the least possible obstruction to the flow of wate
and the interception of all sewage now discharged into the Was
ington Channel and its conveyance to the James Creek sewer cana
but neither of these two works was included in the estimated cost
the improvement, which is $2,716,365.

WORK DONE AND RESULTS OBTAINED.

At the close of the fiscal year ending June 30, 1892, the expendi
tures aggregated $1,780,318.33, and the following work had been accon
plished: The Virginia Channel above Long Bridge had been deepene
to 20 feet at low tide for a width of from 400 to 550 feet, a part
which has since filled up and been redredged. The bar in the san
channel below Long Bridge had been dredged to a depth of 20 fe
and a width of about 350 feet. This part of the Virginia Channel ha
maintained itself to the full depth originally dredged or has deepene
The Washington Channel had been dredged to a depth of 20 feet fo
a width of 350 feet throughout its entire length and to a depth of 1

feet from the 20-foot channel nearly to the easterly margin of the fill, except a small area near the Seventh Street Wharf. This channel for the most part maintained itself until the freshet of June, 1889, when considerable filling took place.

The junction of the Virginia and Washington channels had been dredged to depths of 20 feet, 15 feet, and 12 feet. The greater part of the tidal reservoir had been dredged to a depth of 8 feet. All the material dredged from the river had been deposited on the flats, and of the 12,000,000 cubic yards estimated to be required about 9,303,600 had been deposited. The entire area of the flats, about 621 acres, had been outlined, and practically the entire area to be reclaimed had been raised above overflow at ordinary high tide.

The riprap foundation for the seawall had been put in place around the entire river front of the reclaimed area and the margin of the tidal reservoir. The construction of the seawall for the protection of the margin of the fill from erosion by waves and the action of the currents, had been commenced and about 13,840 linear feet of wall constructed. The construction of a training dike on the westerly side of the Virginia Channel above the Long Bridge had been commenced and partly completed. This dike is intended to maintain the dredged channel and prevent the re-formation of the bar at this locality. The outlet gates at the tidal reservoir at the head of the Washington Channel had been completed with the exception of the railing.

WORK OF THE FISCAL YEAR ENDING JUNE 30, 1893.

During the fiscal year ending June 30, 1893, the expenditures have been $62,847.52. At the commencement of the year, active operations had been nearly suspended for want of funds, the only work then in progress being dredging in the Virginia Channel above Long Bridge. On July 13, 1892, an additional appropriation of $200,000 was made for continuing the improvement.

The operations of the fiscal year have been as follows:

Sea Wall.—Work on the dry masonry sea wall had been suspended December 23, 1891, for want of funds. Under the appropriation of July 13, 1892, proposals for building stone for the wall were invited by public advertisement, August 8, 1892. Bids were opened September 7, 1892, and an abstract of those received will be found appended. The lowest bid received was at the rate of $2.10 per cubic yard. As the stone had been purchased during 1891, under contract, at $1.70 per cubic yard, the above mentioned bid was regarded as too high. With the approval of the Chief of Engineers, all the bids were rejected. The stone was subsequently purchased in open market at $1.70 per cubic yard. The amount of stone to be furnished under the contract was 11,000 cubic yards, so that the open market purchase will effect a saving of $4,400.

Preliminary to the construction of the remainder of the wall on Section III it was found necessary to raise the embankment at localities were there was not sufficient amount of material for filling behind the wall after its construction. This work was done in August and September, 1892, by a hired dredge.

The construction of the wall was resumed on November 11, 1892, on the Virginia Channel front of Section III near the lower end of the section. On December 24, 1892, navigation was closed by ice and further delivery of building stone during the season was impracticable. Owing to this fact and to the continued extreme cold it was found that

this work could not be profitably continued after December 31, 189
and on that date operations were suspended for the season. Fro
November 11, 1892, to December 31, 1892, 700 linear feet of wall we
entirely completed and 360 linear feet built to half height or more. Tl
construction of the wall was resumed March 1, 1893, with a small forc
which was gradually increased as the weather became more favorabl
Three hundred and fifty linear feet were first built on Section I just b
low Easbys Point and work then continued on Section III, where it
still in progress. During April and May, 1893, considerable delay r
sulted from high tides and a freshet. Four thousand four hundre
and fifty linear feet of wall were completed during the fiscal year en
ing June 30, 1893, making a total to date of 18,290 linear feet.

In order to protect the wall from frost and prevent the filling behi
it from being washed out and drawn through the joints of the di
masonry by the action of the waves and the swell of passing steamer
a backing of coarse gravel about 2 feet in thickness is placed behind
Proposals for 5,000 cubic yards of gravel were invited by public adve
tisement August 8, 1892, and opened September 7, 1892. An abstra
of the bids will be found appended to this report. The contract w
awarded to the lowest bidder, Mr. George J. Simpson, of Philadelphi
Pa., at 46 cents per cubic yard, and entered into September 22, 189
The contractor, however, failed to deliver any gravel, and on Novemb
11, 1892, he was notified in writing that unless delivery was made b
November 17, 1892, gravel would be purchased in open market at h
expense, as provided in the specifications. The contractor did not com
mence delivery at that date and an order for the gravel has been plac
in open market, at 60 cents per cubic yard.

Virginia Channel.—On June 30, 1892, dredging in the Virginia Cha
nel above the Long Bridge was in progress under the contract of Fran
C. Somers, of Camden, N. J., dated July 7, 1891, and a channel 20 fe
deep and 200 feet wide had been dredged through the bar which ha
re-formed under the action of the freshet of June, 1889, and subseque
smaller freshets. The available funds being sufficient, this channel w
widened 50 feet on the easterly side. The entire channel was complet
October 18, 1892. It is 20 feet deep, 250 feet wide, and 5,800 feet lon
and the amount of dredging was 461,194 cubic yards. The dredg
material was deposited on Sections I and II, the average height of t
fill made ranging from 12 to 14 feet above low tide. The channel h
afforded material relief to the coal trade of Georgetown. It has be
buoyed by the Light-House Board.

For the continuation of the work on the training dike on the we
erly side of the Virginia Channel, proposals for riprap stone were
vited by public advertisement on August 8, 1892. Bids were open
September 7, 1892, and an abstract of those received will be found a
pended to this report. The contract was awarded to the lowest bidde
George J. Simpson, of Philadelphia, Pa., and was entered into Se
tember 22, 1892. The date for the commencement of delivery was O
tober 11, 1892, but the contractor failed to commence, although
repeatedly promised to do so. Accordingly on November 11, 1892,
was notified by this office that unless he commenced delivery by N
vember 15, 1892, the stone would be purchased in open market at h
expense, as provided in the specifications. Stone has since been so pu
chased as required, at 90 cents per cubic yard. The total amount
purchased up to the close of the fiscal year is 7,280.4 cubic yards.

Washington Channel.—At the close of the fiscal year ending Ju
30, 1892, the dredging in the Washington Channel under the contra

of the Alabama Dredging and Jetty Company remained uncompleted, no work having been done since about February 1, 1892. Four extensions of the contract were granted the contractors upon their application, as stated in the last Annual Report. The fourth extension expired on July 15, 1892, and as the work had not been resumed on that date, the contract was annulled by the Chief of Engineers July 23, 1892.

Under the appropriation of July 13, 1892, proposals were invited by public advertisement August 8, 1892, for dredging in the Virginia Channel, the tidal reservoir, and the Washington Channel, the work at the last-named locality including the unfinished work under the annulled contract of the Alabama Dredging and Jetty Company.

The bids were opened September 7, 1892, and an abstract of those received will be found appended to this report. The contract was awarded to the lowest responsible bidder, the San Francisco Bridge Company, of New York City, N. Y., at the uniform price of 14 cents per cubic yard for each locality, and was entered into September 24, 1892. The time of commencement was December 15, 1892, and the time of completion November 30, 1893. The contractors proposed to use the hydraulic method of dredging and deposit, and the specifications required them to construct such embankments as were necessary to retain the material and secure the required grade. The dredging in the Washington Channel was designated as the first work under the contract, the material to be deposited on Section III.

The contractors commenced the construction of embankments on Section III on December 27, 1892, but requested an extension of time for the commencement of dredging until February 15, 1893, as the dredge which they intended to use was detained in Boston on an uncompleted contract for the State of Massachusetts. This extension was granted December 31, 1892. On February 16, 1893, a second extension of the time of commencement to April 30, 1893, was asked on the ground that the ice and cold weather had prevented the completion of the above mentioned contract. This extension was also granted. The construction of embankments had in the meantime been continued with a small force of men as the weather permitted. A third extension was requested by the contractors, but they were informed that they must put a dredge on the work and proceed with their contract. The embankments were, however, not sufficiently advanced for the deposit of material until June 1, 1893, when dredging was commenced in the Washington Channel between the navigation channel and the wall and near the line of M street south extended. At the close of the fiscal year this work was still in progress.

The winter of 1892–'93 was unusually severe. The river was closed by ice December 24, 1892. On January 3, 1893, the ice was from 4 to 6 inches thick in the tidal reservoir The low temperature continued, and on January 9 the river was frozen over as far as Ragged Point, 88 miles from Washington, where the ice was then about 2 inches thick. On January 21 the ice was 11 inches in thickness in the tidal reservoir, and on January 24 it was from 12 to 14 inches thick on the river above Georgetown. All outdoor work was necessarily suspended. Navigation was entirely closed and not reopened until January 28, when the Norfolk steamers made their way down the river. The ice in the harbor and river immediately below Washington was broken up by tug boats employed by the District Commissioners under a special appropriation of Congress. On February 12, 1893, the river was practically clear of ice, and the Alexandria ferryboats resumed their trips.

MAINTENANCE.

The improvement has now reached a stage where some attent needs to be given the maintenance and preservation of the reservati The rich soil, of which the greater part of the reclaimed area is c posed, induces and fosters a rapid and prolific growth of high wee willows, and other trees and underbrush, which, in the summer sea especially, render access to the various parts of the work quite diffic This growth should be cleared up each year, until the reservation ready to be laid out, graded, and sown with grass seed. Annual pairs will also be needed on the wall and reservoir gates.

The proper police supervision of this extensive area of 621 acres has a become a matter of importance. In order to prevent infractions of law, trespasses, etc., the reservation should be patrolled by moun police or watchmen, and it is recommended that annual provision made for two watchmen.

AREAS.

The following is a summary of the areas of the several portions of reclaimed area of the Potomac River improvement:

Area of Potomac Flats.

Total area (including reservoirs):	Ac
Section I	134
Section II	277
Section III	327
Total area	739
Area of reservoirs:	
Large tidal reservoir	111
Small tidal reservoir	7
Total of reservoirs	118
Total area as above	739
Deduct area of reservoirs	118
Total area of land	621

LONG BRIDGE.

On June 30, 1892, the reconstruction of that part of the Long Brid which crosses the Washington Channel on plans approved by the S retary of War had nearly been completed by the Baltimore and tomac Railroad Company, but on filling the approaches with eart decided settlement and movement of the abutments was develop The movement in the south abutment was so serious that the abutm was taken down to the water level and rebuilt. In order to prev further movement, large numbers of piles were driven in the bed of river between the pier and the abutments. The connection betw the wing walls of the new bridge and those of the reservoir outlet not yet been made by the railroad company. It is advisable, howev that this work be deferred until all danger of further movement in bridge abutments has passed.

The project for the improvement of the Potomac River provided rebuilding the Long Bridge over the Virginia Channel, "with wi spans upon piers offering the least possible resistance to the flow of water." As the improvement progresses the necessity for this becomes more and more urgent. The existing structure is an obstruction to navigation, in that the draw is not properly located, the direction of the opening being oblique to that of the improved channel. The piers of the bridge are more numerous than are necessary in a structure built according to modern plans, and are in a direction oblique to the flow of freshets. Furthermore, they are surrounded by great quantities of riprap stone, which has been deposited around them from time to time to protect them. It is estimated that below low-tide level the natural discharge area of the Potomac River at Long Bridge is reduced over 30 per cent by the piers and their foundations as they exist to-day.

Long Bridge, on account of its faulty construction, remains a constant menace to the interests on the river front above it, and also to the work of improvement of the flats, upon which the Government has already spent a large sum. In the event of a freshet occurring while the river is full of ice, the most serious results are to be apprehended, and such a contingency is not at all unlikely. Should an ice gorge form at Long Bridge, it would back up the waters of the river and overflow portions of the city front and, through the sewers above the bridge, such of the lower parts of the city as are drained by them.

During the freshet of June, 1889, the water reached a height at Long Bridge of about 13 feet above low tide. The street surface at Fourteenth and B streets NW. is about 8 feet above low tide, and during the freshet referred to the water was about 5 feet deep in the street at that locality. Great damage was done by the freshet of 1889, but greater damage may occur from a freshet of lesser magnitude if accompanied by an ice gorge. The bridge should be rebuilt as recommended by the board of engineers.

On December 20, 1892, a special report was made upon the reconstruction of the Long Bridge with special reference to Senate bill No. 3477, Forty-second Congress, first session. As this report contains a detailed description of the existing structure and a summary of the previous action of Congress and the recommendations of the Department in relation to its reconstruction, I append a copy of the same for reference in this connection.

ANACOSTIA RIVER, DISTRICT OF COLUMBIA.

The project for the improvement of the Anacostia River provides for dredging a channel 24 feet deep and 200 feet wide from its mouth to the Navy-Yard Bridge, the channel to be widened with a reduced depth to 1,000 feet, as the demands of commerce require.

In front of the navy-yard a basin is proposed 400 feet wide and 24 feet deep. The material dredged is to be deposited on the flats of the river, and the estimated cost of the improvement is $656,000. An appropriation of $20,000 was made for the improvement of this river September 19, 1890, which was applied to dredging channels 20 feet deep and about 200 feet wide through shoals near the foot of South Capitol street and off Greenleaf or Arsenal Point. This work was completed in May, 1892, and fully described in the annual report for that year.

In accordance with the above project, bulkhead and wharf lines have been established and will be found described in the Report of the Chief of Engineers for 1892, pp. 1080–1083.

About $10,000 have been expended by the Navy Department in dredging a basin in front of the navy-yard 22 feet deep and from 100 to 200 feet wide, the work having been completed in October, 1892.

APPROPRIATIONS.

Appropriations have been made as follows:

Potomac River.

Act of—	
August 2, 1882	$400, 0
July 5, 1884	500, 0
August 5, 1886	375, 0
August 11, 1888	300, 0
September 19, 1890	260, 0
July 13, 1892	200, 0
Total	2, 035, 0

Anacostia River.

September 19, 1890	$20, 0

Amount expended on the improvement up to and including June 30, 1893,	1, 843, 165.
Amount required to complete the improvement in addition to amount on hand	681, 365.
Annual cost of preserving and maintaining (estimated)	5, 000.

Washington is in the collection district of Georgetown, D. C.; nearest light-hous Jones Point, Virginia.

Money statement.

July 1, 1892, balance unexpended		$57, 058. 6
Amount appropriated by act approved July 13, 1892		200, 000.
		257, 058. 6
June 30, 1893, amount expended during fiscal year		63, 346. 4
July 1, 1893, balance unexpended		193, 712. 2
July 1, 1893, outstanding liabilities	$4, 478. 00	
July 1, 1893, amount covered by uncompleted contracts	122, 319. 00	
		126, 797. 0
July 1, 1893, balance available		66, 915. 2
Amount (estimated) required for completion of existing project		681, 365. 0
Amount that can be profitably expended in fiscal year ending June 30, 1895		681, 365. 0

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for dredging in the Potomac River at Washington, D. C., opened Sep tember 7, 1892, by Maj. Charles E. L. B. Davis, Corps of Engineers.

No.	Name and address of bidder.	Virginia channel (170,000 cubic yards) per cubic yard.	Tidal reservoir (130,000 cubic yards) per cubic yard.	Washington channel (500,000 cubic yards) per cubic yard.	Total.	Commence.	Complete.
		Cents.	*Cents.*	*Cents.*			
1	San Francisco Bridge Co., New York, N. Y.	14	14	14	$112, 000. 00	Dec. 15, 1892	Nov. 30, 18
2	P. Sanford Ross, Jersey City, N. J.	15. 9	13¾	15. 9	124, 405. 00	Opening of navigation, 1893.	In one yea
3	John J. Carberry and George J. Simpson, Philadelphia, Pa.	18⅞	15⅔	15	127, 454. 17	May 1, 1893	July 1, 189
4	National Dredging Co., Wilmington, Del.	22	14	16	135, 600. 00	On or before Oct. 7, 1892.	On or befor Dec. 31, 189
5	Frank C. Somers, Camden, N. J.	19⅞	14	18	141, 987. 50	Oct. 1, 1892	Dec. 31, 189

Contract awarded to San Francisco Bridge Company and dated September 24, 1892

Abstract of proposals for furnishing building stone for improvement of the Potomac River at Washington, D. C., opened September 7, 1892, by Maj. Charles E. L. B. Davis, Corps of Engineers.

[11,000 cubic yards.]

No.	Name and address of bidder.	Price per cubic yard.	Amount.
1	William H. Mohler, Washington, D. C	$2.10	$23,100
2	Charles G. Smith & Son, Washington, D. C	2.17	23,870

All bids rejected; prices being excessive.

Abstract of proposals for furnishing gravel for improvement of the Potomac River at Washington, D. C., opened September 7, 1892, by Maj. Charles E. L. B. Davis, Corps of Engineers.

[5,000 cubic yards.]

No.	Name and address of bidder.	Price per cubic yard.	Amount.
1	George J. Simpson, Philadelphia, Pa	$0.46	$2,300
2	George W. Gray, Georgetown, D. C	1.17	5,850

Contract awarded to George J. Simpson and dated September 22, 1892.

Abstract of proposals for furnishing riprap stone for improvement of the Potomac River at Washington, D. C., opened September 7, 1892, by Maj. Charles E. L. B. Davis, Corps of Engineers.

[20,000 cubic yards.]

No.	Name and address of bidder.	Price per cubic yard.	Amount.
1	George J. Simpson, Philadelphia, Pa	$0.72	$14,400
2	Charles G. Smith & Son, Washington, D. C	1.18	23,600
3	William H. Mohler, Washington, D. C	1.23	24,600

Contract awarded to George J. Simpson and dated September 22, 1892.

COMMERCIAL STATISTICS.

[Furnished by Mr. J. W. Averill, Washington, D. C.]

Receipts and shipments.

Calendar year.	Coal.	Ice.	Lumber.	Sand.	Wood.	Miscellaneous.	Total.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
1887	264,947	120,237	37,044	50,000	52.419	94,325	618,972
1888	240,836	108,421	45,101	50,000	33,040	104,177	581,575
1889	92,511	115,506	41,407	75,000	35,351	128,905	488,680
1890	72,089	135,552	69,604	75,000	48.457	118,994	519,696
1891	114,913	123,107	50.106	60,000	48,457	154,636	551,219
1892	280,342	148,692	68,178	20,000	48,457	261,285	766,954

Number of vessels of various classes arriving and departing.

Calendar year.	Steamers drawing from 5 to 15 feet, 100 to 400 tons.	Vessels drawing from 10 to 20 feet, 300 to 1,700 tons.	Vessels drawing from 4 to 10 feet, 30 to 300 tons.	Barges drawing from 4 to 1 feet, 100 to 300 tons.
1887	970	573	2,149	9
1888	710	525	1,588	2,8
1889	675	455	1,563	9
1890	696	491	1,572	2
1891	980	445	1,854	8
1892	1,065	466	2,046	5

Ferry and local passenger steamers are not included in the above. No new line of transportation were established during 1892.

SPECIAL REPORT UPON RECONSTRUCTION OF LONG BRIDGE OVE POTOMAC RIVER AT WASHINGTON, D. C.

UNITED STATES ENGINEER OFFICE,
Washington, D. C., December 20, 1892.

GENERAL: I have the honor to acknowledge the receipt of Depart ment letter of the 10th instant referring for report Senate bill No. 347 Fifty-second Congress, first session, entitled "A bill to provide f doing away with certain grade crossings on the lines of the Baltimor and Potomac Railroad in the city of Washington, D. C., and for othe purposes."

Upon examination of the bill I find that section 10, relating to th Long Bridge over the Potomac River, is the only part that refers t work under my charge, and I therefore limit my report to that sectio

Section 10 of the bill reads as follows:

> SEC. 10. That the said railroad company be, and it is hereby, further required t construct a double track on the Long Bridge over the Potomac River and the islan in the said river, and to build on the Virginia side of the said river two addition spans each one hundred and forty feet long, in consideration whereof the said con pany shall be, and it is hereby, freed and relieved from the obligation to maintai the said railway bridge in good condition for ordinary highway travel; it bein hereby understood and agreed that a proper highway bridge shall be provided the expense of the United States or of the District of Columbia, between the foot Fourteenth street, in the city of Washington, and the Virginia shore at such poi as may be determined upon as most suitable therefor by the Commissioners of t District of Columbia.

This section proposed, in brief, to continue the existence of the presen Long Bridge for the sole use of the Baltimore and Potomac Railroa Company and to discontinue its use as a highway bridge, proposin instead the erection of a new highway bridge at the expense of th United States or of the District of Columbia. In order that th status of this question may be fully understood, I invite attention t the following brief summary of—

Previous action of Congress and reports and recommendations of th Secretary of War.—The question of the reconstruction of the Lon Bridge has been before Congress since December 17, 1872, when th Board of Survey upon the improvement of Washington and Georg town harbors, created by act of March 5, 1872, made a report recom mending as a part of the plan of improvement the rebuilding of th Long Bridge with greater spans and a larger draw, the bridge to b located at right angles to the channel. The high freshet of Novem ber, 1877, emphasized the necessity for entering upon a general plan of improvement of these harbors, and in the Annual Report of June 30, 1878, Mr. S. T. Abert, United States civil engineer, then in charge of the work, recommended as a part of such a plan the construction of a bridge in the place of the present Long Bridge, with piers sunk to the depth that the new channels will require and with spans and draw which will meet the requirements of navigation, while upon the maps accompanying this and subsequent reports the proposed location of the new bridge is shown. In February, 1881, another high freshet occurred, accompanied by the formation of an ice gorge at the Long Bridge, so that a large area of the business portion of Washington was flooded and several spans of the Long Bridge over the Washington channel were swept away. So disastrous was this flood that in the river and harbor act of March 3, 1881, Congress provided for a survey of the Potomac River in the vicinity of Washington with reference to the improvement of navigation, the establishment of harbor lines, and the raising of the flats. Owing to the great interest felt in the subject a board of engineer officers was constituted, consisting of Lieut. Col. Q. A. Gillmore, Lieut. Col. William P. Craighill, and Lieut. Col. C. B. Comstock, to which were referred the report of the survey made by Mr. S. T. Abert, United States civil engineer, and the plan of Maj. William J. Twining, Corps of Engineers, then Engineer Commissioner of the District of Columbia. The board of engineers did not adopt either Mr. Abert's plan or Major Twining's plan in their entirety, but recommended a new plan which combined certain features of each.

In their report, which was submitted to Congress March 8, 1882, the board of engineers made the following recommendation in relation to the Long Bridge:

> It is regarded as necessary to the proper execution of this plan that * * * the Long Bridge shall be rebuilt at an early period during the progress of the improvements with wide spans upon piers offering the least possible obstruction to the flow of water. (Senate Ex. Doc. 126, Forty-seventh Congress, first session, p. 13).

On August 2, 1882, Congress made the first appropriation for improving Potomac River at Washington, and directed that the work be done in accordance with the report of the board of engineers.

It would appear, therefore, that in the adoption of the plan of the board of engineers Congress also adopted their recommendation in relation to rebuilding of the Long Bridge.

Since the inception of the improvement attention has been called in the various annual reports thereon to the necessity for legislation providing for the reconstruction of the bridge. In the report of 1884 Lieut. Col. Hains states that no plan of improvement can be made satisfactory while this bridge remains as it is, a most serious obstacle to the flow of water beneath it; that in its present condition it serves the purpose of a dam and retards the flow of water, and that the only radical cure for the evil effects of the Long Bridge in time of freshets is a new bridge with wider spans.

In the report of 1886 action by Congress is again urged, and it is stated that it has been necessary to stop the dredging of the Virginia Channel, both above and below the bridge, at some distance from the same, for fear of injuring the foundations of the piers.

In February, 1888, a special report was made in reference to the probabilities of damage to the improvement on the city front and to the city itself by a high spring freshet. This report was transmitted to Congress and printed in House Ex. Doc. No. 170, Fiftieth Congress, first session. It recommended that the Long Bridge should be rebuilt without delay, and set forth the reasons for this action.

A copy of this report is herewith. (Inclosure No. 1.)*

In June, 1889, the anticipated freshet came and proved higher than any previously known. The results were disastrous, the lower parts of the city were flooded, the river improvement was seriously damaged, and great loss resulted. In the report for 1889 will be found full details of this freshet, which rose to a height of nearly 13 feet at Long Bridge and wrecked one span of this bridge over the Virginia Channel. On April 5, 1890, the Secretary of War transmitted to the Senate, in response to a resolution of the Senate of March 7, 1890, a report from Lieut. Col. Hains relative to the separation of the wagon road from the railroad, on the north side of the main channel of the Potomac (printed in Senate Ex. Doc. No. 96, Fifty-first Congress, first session), a copy of which is herewith. (Inclosure No. 2.)* In this report Col. Hains recommends the separation of the wagon road from the railroad as a part of a project which looks to the raising of the grade of the railroad tracks across the flats high enough to give passageway for vehicles under them, and to the reconstruction of the bridge over the main channel of the river on wider spans that will cause less obstruction to the flow of water. He submits plans for the location and construction of the proposed bridge, which will be found attached to the report.

In the Annual Report of June 30, 1890, Colonel Hains states that it is now imperative that this work should be no longer delayed, if the destruction of the bridge itself, as well as damage to the work on the river front and still greater damage to the city is not to be invited.

Again, in 1891, it is stated that as the improvement progresses the necessity for rebuilding the Long Bridge becomes more and more urgent, that on account of its faulty construction it remains a constant menace to the interests on the river front above it and also to the work of improvement upon which a large sum has been expended by the Government, that in the event of a freshet occurring while the river is full of ice the most serious results are to be apprehended from the probable formation of an ice gorge at the bridge and the consequent backing up of the water and the flooding of the lower parts of the city.

Having thus summarized the previous action in reference to this question, I respectfully invite attention to—

The existing condition of the Long Bridge.—At the date of the inception of the Potomac River improvement (1882) the Long Bridge consisted of three parts, viz: Commencing at the Washington shore, (1) a bridge across the Washington Channel of wooden spans on masonry piers and about 700 feet in length, (2) a causeway of earth between masonry retaining walls across the flats between the two channels and about 1,980 feet in length, and (3) a bridge across the Virginia Channel about 2,000 feet in length which is the structure specifically referred to in section 10 of the pending bill.

The Long Bridge across the Virginia Channel, is, as shown on the plan of the same herewith inclosed (inclosure No. 3),* a wooden Howe truss bridge consisting of 13 spans of 135 feet each in the clear and one draw span 182 feet in length swinging on a pivot pier giving two openings of about 70 feet, only one of which is arranged for the passage of vessels. Each span except the draw consists of three wooden trusses. The extreme width of the bridge from out to out of trusses is 40.4 feet. On the up-stream or northwest side is a wagon road 19.2

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*Sent with original report.

feet wide in the clear, but with no sidewalk, while on the down-stream side is the single track of the Baltimore and Potomac Railroad, with a clear width between trusses of 13.2 feet. The bridge spans rest upon masonry piers built of an inferior quality of sandstone and founded upon pile and grillage foundations, the grillage being at the level of low tide. In order to prevent these insecure foundations from being undermined by the river currents, large quantities of riprap stone have been thrown into the river and piled about them until there is now a series of immense mounds extending across the river channel as shown upon the plan herewith inclosed (inclosure No. 3).* So great is this obstruction that the natural discharge area of the river at the Long Bridge is reduced *no less than 30 per cent* by these pier foundations and the riprap stone deposited about them.

And not only this, but the direction of the bridge is not normal to the direction of the proposed, the present, nor even the original channel, so that the piers (being built at right angles to the line of the bridge) are not parallel to the direction of the current, but are oblique to it, and so become themselves a serious obstruction during freshets.

A further obstruction arises during freshets from the height of the existing bridge. The lower chord is but 10.3 feet in the clear above low tide, while the floor is but 13 feet above low tide.

The freshet of 1889 rose to a height of 12.7 feet above low tide, at the Long Bridge, and thus the superstructure of the bridge diminished the maximum freshet cross section by a depth of no less than 2.4 feet, or about one-fifth of the height which the water rose above low tide.

The cross section of the river at the Long Bridge for freshet discharge has been greatly diminished by reason of the closing of the Washington Channel as a necessary part of the plan of improvement. This diminishes the available freshet cross section at the bridge by about 22 per cent, based upon the freshet cross section of 1877. The height as well as the discharge cross section of the freshet of 1889, however, were much greater than that of 1877, and the area required for the discharge of such a freshet would be much greater than was estimated when the plans for the improvement were originally prepared.

The draw of the existing bridge is badly located, having been placed near the easterly edge of the navigation channel. Although this channel has since been widened by dredging, the draw opening is oblique to the general direction of the channel and the current, and the opening is therefore a difficult one for vessels to pass, and so interferes with the safe navigation of the river.

The Baltimore and Potomac Railroad Company was authorized to take possession of the Long Bridge by an act of Congress approved June 21, 1870, which in part provides as follows:

> *Provided*, That the said Baltimore and Potomac Railroad Company will maintain in good condition the said bridge for railway and ordinary travel; and the bridge shall at all times be, and remain, a free bridge for public use for ordinary travel.
>
> * * * * * * *
>
> That if the said Baltimore and Potomac Railroad Company shall at any time neglect to keep said bridge in good repair and free for public use for ordinary travel the Government of the United States may enter into possession of the said bridge; and Congress reserves the right to alter or amend this law.

The Baltimore and Potomac Railroad Company has rebuilt that part of the bridge which crosses the Washington Channel upon plans approved by the Secretary of War aud substantially in accordance with those recommended by Lieut. Col. Haines in his special report of April, 1890, above referred to and herewith inclosed (inclosure No. 2).*

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*Sent with original report.

Upon the causeway of the Long Bridge the company have laid a double track in place of the former single track, and have moved the roadway to the northwestward out upon the reclaimed area of the Potomac River improvement to make room for the new track.

Recommendations.—Referring in detail to the provisions of section 10 of the bill above quoted, I submit the following considerations and recommendations in relation thereto.

The section provides that the Baltimore and Potomac Railroad Company be empowered to construct a double track across the "island" in the Potomac River, evidently referring to the reclaimed area of the improvement between the Washington and Virginia channels. As stated above, however, the company have already laid this track and it is in daily use. Owing to the increased traffic with the South, which passes over the bridge, this additional track is a source of safety to the traveling public, and I see no objection to its affirmative authorization by law, provided the right of way across the reclaimed area is limited to 30 feet in width and the number of tracks is limited to two, with the further proviso that the tracks shall always be used as running tracks, and that no cars shall be stored on them.

Section 10 next provides for the retention of the existing bridge, extending it two spans in length on the Virginia end, laying a double track upon it, discontinuing the highway and relieving the railway company from their obligation to maintain the bridge for ordinary highway travel and proposing that a highway bridge shall be provided at the expense of the United States or the District of Columbia.

The extension of the bridge by building two spans of 140 feet each at the southwest or Virginia end is evidently intended to provide an increased area for the discharge of freshets. The railway company have adopted a part of the suggestion of Mr. Abert in his report on the survey of 1881 which was that the bridge be extended 400 feet. This plan was not, however, approved by the Board of Engineers. The two spans additional proposed in the bill would be quite insufficient for the purpose and would afford only the slightest relief to existing conditions, particularly as the bill does not provide for deepening the river at this locality. From the considerations which I have already adduced, I am of the opinion that the existing Long Bridge should be entirely removed and for the following specific reasons:

1. The existing Long Bridge is an *obstruction* to *navigation*. In compliance with the provisions of law it has already been reported as such, the draw is improperly located and the defective location and construction of the bridge prevents the completion and free use of the dredged channel by vessels navigating the river.

2. The existing Long Bridge *interferes with the progress of the Potomac River Improvement.* That improvement has proceeded upon certain plans approved by specific action of Congress providing that the work should be executed in accordance with the report of the Board of Engineers of 1882. As already stated, the Board recommended "*that the Long Bridge shall be rebuilt at an early period during the progress of the improvements with wide spans upon piers offering the least possible resistance to the flow of water.*" This being a part of the plan approved by Congress, the work has proceeded upon the assumption that the bridge would be rebuilt. The new lines of channel have been laid out with

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* Sent with original report.

this in view and the dredging of the new channel has been carried as close to the bridge as could be done without endangering the structure. The bridge as it stands prevents the completion of the work.

3. *The existing Long Bridge endangers* the work already done on the river improvement and jeopardizes the property of the citizens of Washington. This structure, with the immense masses of riprap stone piled about the pier foundations, act as a submerged dam which, together with the oblique piers and low wooden trusses, dams back the water during freshets and causes the deposit of sediment in the dredged channel, while the flood water spreads over the reclaimed land of the improvement and then over the low-grade streets in the business part of the city of Washington, causing interruption of business and great loss of and injury to property. It is not necessary to adduce any theoretical considerations to prove that this will be the case, as it has actually occurred. The business part of the city has been flooded three times, causing great loss, and from the backing of sewage into the streets endangering the sanitary condition of the city. The most disastrous flood of this kind was that of 1881, when an ice gorge formed at the Long Bridge, flooding Pennsylvania avenue as far as the Capitol. The results of this flood are graphically shown upon the map of Washington which I herewith inclose (inclosure No. 4),* showing the submerged area of the city at that time.

4. *The existing Long Bridge is an unsafe structure* and should therefore be removed. It is liable to be swept away during any high freshet, and during the freshet of 1889 the railway company ran loaded trains out on the bridge to keep it from being swept away. Not only are the foundations insecure owing to recent dredging, but the wooden trusses are not adapted to modern railway loads, while they are liable to be destroyed by fire at any time.

Section 10 of this bill contemplates the building of a new bridge for highway travel only. The provision for such a bridge as expressed is a most vague and indefinite one. The bill reads, "it being hereby understood and agreed that a proper highway bridge shall be provided," etc. I take it that such a provision of law as this would not go far toward providing the new highway bridge proposed. The existence of two bridges across the Potomac River at this point is objectionable from every point of view. It would be exceedingly detrimental to navigation. This general line of highway travel should be preserved, and this would bring the two bridges close together. There would, therefore, be much trouble, delay, and danger to vessels in passing through the two draws. Both draws would need to be open at the same time and this of itself would delay the railroad and highway travel. Aside from this, with the present bridge still in existence, the obstruction of the channel during freshets would only be increased, with all its resultant dangers. Two bridges at this point would in every way be detrimental to the interests of navigation, of the United States, and the citizens of Washington, and I recommend that such a proposition be not entertained.

Nor do I see any reason why Congress should donate the present bridge to the railway company and impose upon the people the cost of a new bridge. The existing bridge was built by and belonged to the United States. It was then put into the possession of the railway company *on the condition that it should be maintained as a bridge for highway travel.* Now, the railway company proposes by this bill to appropriate the entire bridge to its own use as a corporation and let the United States or the District of Columbia build one for highway travel.

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* Sent with original report.

The only remedy for the existing conditions is the construction of a new bridge designed to accommodate both railroad and highway travel, located at right angles to the new channel, built with wide spans on substantial masonry piers whose foundations are at the bed of the new channel, with a superstructure of steel placed well above the freshet line, and an ample draw properly located.

The plans for such a bridge have already been submitted to Congress in the report of Lieut. Col. Hains of April 2, 1890, and herewith inclosed. (Inclosure No 2.)*

I therefore respectfully recommend the amendment of the bill by striking out section 10 entirely and substituting the following section therefor:

SEC. 10. That the Secretary of War be, and he is hereby, authorized and directed to cause to be constructed across the Virginia Channel of the Potomac River near the site of the present Long Bridge a new and substantial bridge of iron or steel resting on masonry piers and provided with suitable approaches and with a draw sufficient for the accommodation of the navigation of the said river. The said new bridge shall be so located that its longitudinal center line shall be normal to the general direction which the Virginia Channel will have when the Potomac River improvement is completed; the length of said bridge shall not be less than twenty-five hundred feet and no span shall be less than two hundred and fifty feet. The piers of the said new bridge shall rest upon sufficient foundations, at or near the present or proposed bed of the river. The superstructure of said bridge shall have a clear head room of not less then twenty feet above mean low tide of the Potomac River, and the said bridge shall provide for a double-track railway, for a roadway for high way travel not less than twenty feet wide, and a sidewalk not less than eight feet wide, side by side, the railway and the roadway to be separated by a tight fence not less than sixteen feet high.

Upon the completion of the new bridge herein authorized, the present Long Bridge, together with the piers, foundations, and riprap about them, shall be entirely removed.

Provided, That one-half of the cost of the said new bridge and one-half of the cost of the removal of the present bridge shall be paid by the Baltimore and Potomac Railroad Company, and that the said work shall be done by contract, after public advertisement, the said contract to be conditioned upon payments as herein provided.

And there is hereby appropriated out of any money in the Treasury not otherwise appropriated a sum of money equal to one-half the cost of the work provided for in this section as the same may be certified to by the Secretary of War.

Provided further, That the said Baltimore and Potomac Railroad Company shall maintain the said bridge in good condition for railway and ordinary travel and shall maintain the draw in efficient working condition at all times, and shall operate the same so as not to impede the free navigation of the Potomac River at all hours of the day or night; and the bridge shall at all times be and remain a free bridge for public use for ordinary travel, and the said Baltimore and Potomac Railroad Company shall give other railroad companies the right to pass over said bridge upon such reasonable terms as may be agreed upon or as Congress may prescribe.

And if the said Baltimore and Potomac Railroad Company shall at any time neglect to keep said bridge in good repair and free for public use for ordinary travel, the Secretary of War may enter into possession of the whole of said bridge for and on behalf of the United States, and Congress reserves the right to alter or amend this law.

Very respectfully, your obedient servant,

CHAS. E. L. B. DAVIS,
Major, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY.
Chief of Engineers, U. S. A.

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* Sent with original report.

dike was therefore adopted in the project of July 16, 1892. Proposals for furnishing riprap stone were invited by public advertisement under date of August 8, 1892. Bids were opened September 7, 1892, and contract entered into with Daniel McConville, of Washington, D. C., at 79 cents per cubic yard. The delivery of stone under the contract was commenced October 19, 1892. The line of this dike, as shown upon sheet number 1 of the maps accompanying the report upon the survey and the project for the improvement, and printed in House Ex. Doc. No. 75, Fifty-first Congress, first session, commences at the right bank of the river at Occoquan below the wharves of the town and extends thence down the river nearly parallel to the dredged channel. No objection to this location was presented by any of the citizens of Occoquan when this report was printed or at any time prior to the commencement of the work. Under date of October 19, 1892, however, a communication was addressed to the Chief of Engineers by J. A. Marshall, of Alexandria, who stated that he owned a wharf on the river front at Occoquan which would be rendered worthless by the dike. On October 21 Mr. Marshall telegraphed this office, stating that his property would be ruined, and on October 24 he called at this office and stated that he had obtained an injunction from a State court of Virginia to restrain the contractor from continuing the work. This injunction was subsequently served on the contractor and report of such service made to the Chief of Engineers by this office October 31, 1892. In this report it was stated that it would be a loss to the Government and be detrimental to the public interests to stop the work and it was recommended that the Department of Justice be requested to defend the rights of the United States to construct this dike. On November 7, 1892, the Secretary of War was informed by the Attorney-General that he had directed the United States attorney for the eastern district of Virginia to consult with this office and if the law and the facts warranted it to take such steps as might be necessary to have the injunction dissolved. November 10 and 11, 1892, Mr. T. R. Borland, United States attorney for the eastern district of Virginia, was furnished by this office with full information and copies of papers relating to the case.

Meanwhile the contractor proceeded with furnishing riprap and constructing the dike on parts of the line which were not in front of Marshall's property. On December 7, 1892, a letter was addressed by this office to the United States district attorney, asking what the prospect was of an early dissolution of the injunction and calling attention to the fact that in case of material delay it would be necessary to suspend the work.

On December 9, 1892, the district attorney replied that it would be a month from that time, at the very earliest, before an order could be obtained dissolving the injunction.

On December 12, 1892, the attention of the Chief of Engineers was invited to the delay in the case and in view of the importance of early action it was recommended that application be made to the Department of Justice to expedite matters. In reply this office was informed that the Attorney-General had written the United States attorney, directing him to secure, if practicable, an immediate dissolution of the injunction.

On December 29, 1892, the United States district attorney wrote that he should "endeavor to get the case up on motion to dissolve the injunction in January, 1893."

As already stated, the river was closed by ice on December 23, 1892, and operations suspended for the season in consequence. The de-

The lower, or outer section, of this channel, 870 feet in length, was dredged to a width of 150 feet to counteract the deteriorating action of cross-tidal currents. The upper section, 3,720 feet in length, was dredged to a width of 100 feet. The material from the lower section was removed in scows, while that from the upper section was deposited on the right side of the channel, so as to form an embankment.

The available balance of the appropriation remaining after the completion of the channel at the Lower Mud was applied to dredging a a part of the channel through Occoquan Bar, which was next in order as an obstruction to navigation. This channel was made 8 feet deep to provide for anticipated filling from freshets before the construction of the dike. The upper section of this channel was dredged to a width of 100 feet, and the lower section to a width of 70 feet, when all the available funds having been exhausted, the work was closed.

The second appropriation under the new project was made July 13, 1892, the amount being $5,000.

Under date of August 8, 1892, proposals for dredging at Occoquan Bar, the Sand Bar, and the Upper Mud were invited by public advertisement. Proposals were opened September 7, 1892, and a contract entered into with Daniel McConville, of Washington, D. C., the lowest bidder.

Dredging at Occoquan Bar was commenced November 8, 1892, with an endless-chain dredge. The dredge was not in good repair, however and slow progress was made with the work. The sinking of a scow repairs to the tug, and the difficulty of reaching the dumping ground with the tug employed were further causes of delay. On December 23 1892, the river was closed by ice and operations were necessarily suspended for the season. The winter proved to be one of exceptiona severity and the plant was injured by ice, so that extended repairs were required in the spring. Dredging at Occoquan Bar was resumed with a clam-shell dredge March 29, 1893, and the channel through this bar was dredged to the full width of 100 feet on April 14, 1893.

The total amount of material dredged at this bar under the contract of Daniel McConville was 2,275 cubic yards. Under the contract o F. L. Somers, closed May 16, 1892, 12,399 cubic yards had been dredged so that the total dredging at Occoquan Bar to secure a channel 100 fee wide and 8 feet deep has been 14,674 cubic yards.

At the "Sand Bar," one-half of a mile below Occoquan, the survey showed that the general depth had been increased owing to the constant dredging of sand at this bar for the Washington market and that but little dredging would therefore be required to secure a channel 100 feet wide and 6 feet deep. Dredging at this bar under the contract of Daniel McConville was commenced April 18, 1893 and completed May 16, 1893, the amount of dredging having been 1,576 cubic yards. The natural channel was widened so as to secure a width o 100 feet and a depth of 6 feet at low tide.

Dredging at the Upper Mud was commenced June 3, 1893. The channel was widened chiefly on the easterly or left side and the material deposited so as to form an embankment.

On June 30, 1893, dredging at the Upper Mud was still in progress.

The project for improving Occoquan Bar provided for the construction of a dike to confine the water to the dredged channel and preven the bar from forming again during freshets. In the general project i was proposed to build this dike of piles and sheet piling, but as an abundance of stone is found at Occoquan a dike of riprap stone was found to be less expensive and of course more durable. This form o dike was therefore adopted in the project of July 16, 1892. Proposals for furnishing riprap stone were invited by public advertisement under date of August 8, 1892. Bids were opened September 7, 1892, and contract entered into with Daniel McConville, of Washington, D. C., at 79 cents per cubic yard. The delivery of stone under the contract was commenced October 19, 1892. The line of this dike, as shown upon sheet number 1 of the maps accompanying the report upon the survey and the project for the improvement, and printed in House Ex. Doc. No. 75, Fifty-first Congress, first session, commences at the right bank of the river at Occoquan below the wharves of the town and extends thence down the river nearly parallel to the dredged channel. No objection to this location was presented by any of the citizens of Occoquan when this report was printed or at any time prior to the commencement of the work. Under date of October 19, 1892, however, a communication was addressed to the Chief of Engineers by J. A. Marshall, of Alexandria, who stated that he owned a wharf on the river front at Occoquan which would be rendered worthless by the dike. On October 21 Mr Marshall telegraphed this office, stating that his property would be ruined, and on October 24 he called at this office and stated that he had obtained an injunction from a State court of Virginia to restrain the contractor from continuing the work. This injunction was subsequently served on the contractor and report of such service made to the Chief of Engineers by this office October 31, 1892. In this report it was stated that it would be a loss to the Government and be detrimental to the public interests to stop the work and it was recommended that the Department of Justice be requested to defend the rights of the United States to construct this dike. On November 7, 1892, the Secretary of War was informed by the Attorney-General that he had directed the United States attorney for the eastern district of Virginia to consult with this office and if the law and the facts warranted it to take such steps as might be necessary to have the injunction dissolved. November 10 and 11, 1892, Mr. T. R. Borland, United States attorney for the eastern district of Virginia, was furnished by this office with full information and copies of papers relating to the case.

Meanwhile the contractor proceeded with furnishing riprap and constructing the dike on parts of the line which were not in front of Marshall's property. On December 7, 1892, a letter was addressed by this office to the United States district attorney, asking what the prospect was of an early dissolution of the injunction and calling attention to the fact that in case of material delay it would be necessary to suspend the work.

On December 9, 1892, the district attorney replied that it would be a month from that time, at the very earliest, before an order could be obtained dissolving the injunction.

On December 12, 1892, the attention of the Chief of Engineers was invited to the delay in the case and in view of the importance of early action it was recommended that application be made to the Department of Justice to expedite matters. In reply this office was informed that the Attorney-General had written the United States attorney, directing him to secure, if practicable, an immediate dissolution of the injunction.

On December 29, 1892, the United States district attorney wrote that he should "endeavor to get the case up on motion to dissolve the injunction in January, 1893."

As already stated, the river was closed by ice on December 23, 1892, and operations suspended for the season in consequence. The delivery of stone had, however, been suspended by the contractor on December 10, 1892, in order to use the scows for raising the sunken dump scow used on the dredging contract.

On February 23, 1893, as the season for resuming work was approaching and as no advices of action in the case of Marshall vs. McConville had been received from the United States district attorney, a letter was addressed to that officer, asking what progress had been made in dissolving the injunction. The district attorney replied that he had arranged with counsel for an argument between March 20 and 27, 1893, and intimated that in case of appeal a delay of six months might ensue.

The delivery of stone under the contract was resumed on March 27, 1893, and continued until April 29, 1893, when the limits imposed on the contractor by the injunction were reached and he suspended operations.

The contractor requested, under date of April 20, 1893, that his contract be considered as closed and the reserved percentages paid him. On April 21, 1893, this request was forwarded to the Chief of Engineers, with an indorsement stating the proceedings had in this case, and the ineffectual efforts to secure action on the part of the United States district attorney. On April 24, 1893, the Chief of Engineers directed that supplementary articles of agreement be prepared, closing the contract. These supplementary articles of agreement were prepared and signed May 2, 1893, and having received the approval of the Secretary of War, the contract was closed.

The dike is built of riprap stone. The top is 4 feet wide and 3 feet above low tide, and the side slopes are 1 on 1. The stone was paid for by the cubic yard, measured, compactly piled by cubic contents on flat scows. The total amount delivered was 1,621.4 cubic yards; 622 linear feet of dike were entirely completed and 161 linear feet partly completed.

FUTURE OPERATIONS.

The work remaining to be done is the completion of the channel at the Upper Mud and the completion and construction of the dikes at Occoquan Bar, the Sand Bar, and the Upper Mud. The estimated cost of the remaining work, based on the original estimate, is $30,000.

APPROPRIATIONS.

The following appropriations have been made for the new project:

September 19, 1890	$10,000
July 13, 1892	5,000
Total	15,000

Occoquan Creek is in the collection district of Alexandria, which is also the nearest port of entry. The nearest light-house is at Fort Washington, Md.

Money statement.

July 1, 1892, balance unexpended		$206.01
Amount appropriated by act approved July 13, 1892		5,000.00
		5,206.01
June 30, 1893, amount expended during fiscal year		2,712.33
July 1, 1893, balance unexpended		2,493.68
July 1, 1893, outstanding liabilities	$60.00	
July 1, 1893, amount covered by uncompleted contracts	1,206.00	
		1,266.00
July 1, 1893, balance available		1,227.68

Amount (estimated) required for completion of existing project........	$30,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	30,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for dredging in Occoquan Creek, Virginia, opened September 7, 1892, by Maj. Charles E. L. B. Davis, Corps of Engineers.

No.	Name and address of bidder.	Occoquan Bar and Sand Bar (3,500 cubic y'ds), per cubic yard.	Upper Mud (8,000 cubic y'ds), per cubic yard.	Total.	Commence.	Complete.
		Cents.	*Cents.*			
1	D. McConville, Washington, D. C.	19¾	12½	$1,691.25	On or before Oct. 15, 1892.	On or before Jan. 1, 1893.
2	Thos. P. Morgan, Washington, D. C.	24	13⁷⁄₁₆	1,962.00	On or before Oct. 1, 1892.	On or before Jan. 1, 1893.
3	Frank C. Somers, Camden, N. J.	37½	20	2,912.50	On or before Oct. 1, 1892.	Dec. 31, 1892.
4	Fred L. Somers, Philadelphia, Pa.	39	22	3,125.00	Sept. 20, 1892.	Jan. 1, 1893.

Contract awarded to D. McConville and dated September 21, 1892.

Abstract of proposals for furnishing riprap stone for improvement of Occoquan Creek, Virginia, opened at Washington, D. C., September 7, 1892, by Maj. Charles E. L. B. Davis, Corps of Engineers.

[3,300 cubic yards.]

No.	Name and address of bidder.	Price per cubic yard.	Amount.
1	Daniel McConville, Washington, D. C	$0.79	$2.607
2	Consolidated Quarry Co., Washington, D. C	2.50	8,250
3	Charles G. Smith & Son, Washington, D. C	2.58	8,514
4	William H. Mohler, Washington, D. C	3.09	10,197

Contract awarded to Daniel McConville and dated September 21, 1892.

COMMERCIAL STATISTICS.

[Furnished by Messrs. L. Ledman and Tyson Janney, Occoquan, Va.]

Receipts and shipments for calendar year 1892.

	Tons.
Coal	100
Grain	550
Lumber	800
Wood	3,600
Railroad ties	3,000
Sand	48,000
Miscellaneous	655
Total	56,705

No new lines of transportation were established during 1892.

J 3.

IMPROVEMENT OF AQUIA CREEK, VIRGINIA.

ORIGINAL CONDITION.

Aquia Creek is a tributary of the Potomac River, which it enters 41 miles below Washington, D. C. The stream is navigable to Wharton Landing, about 7.25 miles above the mouth. The upper part of the creek has a well-defined channel, with a width of from 60 to 200 feet, while the depth was originally from 2 to 17 feet. At a point called the Narrows, about 4.5 miles above the mouth, the stream suddenly expands into a wide bay, from 1,000 to 6,000 feet wide, forming a continuous shoal, on which the depth ranged generally from 2 to 4 feet, increasing near the mouth to about 7 feet. About 3 miles above, the mouth the creek is crossed by a trestle bridge of the Richmond, Fredericksburg and Potomac Railroad. The bridge is provided with a draw 28 feet wide.

Between 1872 and 1878 $10,000 was appropriated by Congress and expended in dredging a channel through shoal portions of the creek between Davis Point (about one-third of a mile below the railroad bridge) and Wharton Landing, the channel being from 40 to 50 feet wide and from 4 to 5 feet deep at low tide.

A new survey of the creek was authorized by the river and harbor act of August 11, 1888, and made in 1889, under the direction of Mr. S. T. Abert, United States agent. The channel formerly dredged was found to be about 40 feet wide and from 4 to 5 feet deep between the railroad bridge and the Narrows. Below the railroad bridge and in the upper part of the creek, near Wharton Landing, it had filled in. Dent Landing, about three-quarters of a mile below Wharton Landing, was regarded as the highest point to which navigation could be maintained except at great expense. The obstructions to navigation below Dent Landing were the long shoal of soft mud between the mouth and the Narrows, on which the depth ranged from 2 to 4 feet; a short bar at the mouth of Austen Creek, with a ruling depth of 4 feet; and a wreck at Coal Landing.

PLAN OF IMPROVEMENT.

In the report on the survey (Report of Chief of Engineers, 1890, pp. 1096–1103), Mr. Abert proposed a channel 150 feet wide and 8 feet deep between the mouth and the Narrows, and a channel 80 feet wide and 8 feet deep through the bar at the mouth of Austen Creek. The estimated cost of the improvement was $101,278.

On September 19, 1890, Congress appropriated $10,000 for this work. Upon further examination of this creek in 1890 the character of its navigation and the amount of its trade did not seem to warrant so large an expenditure as was proposed in Mr. Abert's report. Six-foot navigation was regarded as sufficient to give all the relief needed to navigation at the present time, leaving the subject of greater depth for future action, if trade were developed by this improvement.

The following project for the work was therefore adopted, December 4, 1890: A channel 80 feet wide and 6 feet deep to be dredged between the mouth and the Narrows, at an estimated cost of $40,000, the material dredged below the railroad bridge to be removed in scows, and that above the bridge for the most part to be deposited on the sides of the channel. The proposed work above the Narrows was omitted.

WORK DONE AND RESULTS OBTAINED.

Under the appropriation of September 19, 1890, of $10,000, a channel 6 feet deep and 80 feet wide was dredged through the two shoals, which had less depth between the mouth and the railroad bridge. The dredged channel was commenced near Thorny Point, about 1 mile above the mouth.

The total length of the channel from the 6-foot curve, near Thorny Point, to the railroad bridge is 12,280 feet. In this distance it was unnecessary to dredge for a length of 3,400 feet, as a depth of 6 feet was found. The channel is thus divided into two sections, the lower being 2,740 feet in length, and the upper, near the bridge, 6,140 feet in length. The material dredged was soft mud. It was removed in scows and deposited in the Potomac River off Brents Point. The total amount of dredging under the contract was 60,438 cubic yards. The contract price was 12½ cents per cubic yard.

This work completed the approved project of 1890 up to the draw of the railroad bridge.

An appropriation of $5,000 was made for continuing the improvement in the river and harbor act of July 13, 1892.

The work remaining to complete the project for this improvement is the dredging of the channel between the railroad bridge and the Narrows, a distance of about 6,500 feet. The draw through the railroad bridge is about 28 feet wide. This width is insufficient for the passage of the dredges now usually employed on river and harbor work. A dredge such as would be required for the proper and economical execution of the work above the bridge would be about 35 feet wide, and to permit the passage of such a dredge the draw should be widened to at least 40 feet. The attention of the Richmond, Fredericksburg and Potomac Railroad was called to this matter on March 24, 1891. As no action was taken by the company, proceedings were instituted under the provisions of the act of September 19, 1890, to compel the railroad company to widen the draw to 40 feet. A special report upon the subject was made October 27, 1892. The Secretary of War directed a hearing, which, after due notice, was held at this office November 10, 1892.

On December 6, 1892, the Secretary of War ordered the Richmond, Fredericksburg and Potomac Railroad Company to widen the draw to 40 feet.

On January 23, 1893, the Secretary of War revoked the above order.

In view of this action it became necessary to modify the plan of the work above the bridge and adapt it to the class of dredge which could be taken through the draw. The material above the bridge was for the most part to be deposited on the sides of the channel, so as to form an embankment. As this mud is exceedingly soft and liable to run into the channel, it was proposed that it be deposited so that the foot of the inner slope of the embankment should be not less than 20 feet from the edge of the 80-foot channel, and the first specifications for this work issued in 1891 were so prepared. To form such an embankment would require a clam-shell dredge provided with a very long boom, and such a boom can only be carried by a wide dredge. The distance from the edge of the channel to the foot of the slope was therefore reduced to 15 feet and the work offered for contract under date of February 13, 1893. The specifications provided for two classes of dredging, the material between the railroad bridge and the first island above to be removed in scows, and above the first island to be deposited on the sides of the channel.

Bids were received March 15, 1893, and an abstract of them is given at the end of this report.

The contract was awarded to Frank C. Somers, of Camden, N. J., and entered into March 27, 1893. The date for the commencement of the work under this contract is July 15, 1893.

FUTURE OPERATIONS.

The work remaining to be done under this contract is the completion of the channel above the railroad bridge. Recent and more detailed surveys show the amounts of dredging to be less than originally estimated, while lower prices have been obtained on the several contracts than were assumed in the project. It is now estimated that the present project can be completed for $10,000.

APPROPRIATIONS.

The following appropriations have been made for the new work:

September 19, 1890	$10,000
July 13, 1892	5,000
Total	15,000

Aquia Creek is in the collection district of Alexandria, which is the nearest port of entry. The nearest light-house is at Upper Cedar Point, Maryland.

Money statement.

July 1, 1892, balance unexpended	$610.95
Amount appropriated by act approved July 13, 1892	5,000.00
	5,610.95
June 30, 1893, amount expended during fiscal year	625.20
July 1, 1893, balance unexpended	4,985.75
July 1, 1893, amount covered by uncompleted contracts	3,300.00
July 1, 1893, balance available	1,685.75
Amount (estimated) required for completion of existing project	25,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	15,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for dredging at Aquia Creek, Virginia, opened March 15, 1893, at Washington, D. C., by Maj. Charles E. L. B. Davis, Corps of Engineers.

No.	Name and address of bidder.	14,000 cubic yards removed in scows. Per cubic yard.	16,000 cubic yards deposited on sides of channel. Per cubic yard.	Amount.	Commence.	Complete.
		Cents.	*Cents.*			
1	Frank C. Somers, Camden, N. J.	11	11	$3,300	On or before July 15, 1893.	Oct. 31, 1893.
2	Thos. P. Morgan, Washington, D. C.	15	10	3,700	Apr. 1, 1893	June 16, 1893.
3	G. K. Baker, Berkley, Va.	15	14	4,340	Apr. 15, 1893	Aug. 15, 1893.

Contract awarded to Frank C. Somers and dated March 27, 1893.

COMMERCIAL STATISTICS.

[Furnished by Mr. R. L. Flatford, Garrisonville, Va.]

Tonnage for calendar year 1892.. 23,800

A steamboat line from Washington, giving triweekly service, was established during the year.

J 4.

IMPROVEMENT OF LOWER MACHODOC CREEK, VIRGINIA.

ORIGINAL CONDITION.

Lower Machodoc Creek is a tidal estuary of the Potomac River which it enters on the right about 85 miles below Washington, D. C. It is the next stream below Nomini Creek and its mouth is just above Coles Point. The creek lies within Westmoreland County, Va., and has a navigable length of about 4 miles. The width between banks at the mouth is 1 mile and between the 12-foot contours the channel width exceeds 3,000 feet. The lower part of the creek for a distance of 1½ miles above the mouth is from three-fourths of a mile to 1 mile in width, with a navigable depth of 13 feet, affording a safe harbor during northeast to southeast storms.

At the "Narrows," 2 miles above the mouth, the stream suddenly contracts to a width of 650 feet and the channel is obstructed by a sand bar over which but 4 feet can be carried at low tide. This bar constitutes the principal obstruction to navigation.

On the right there is a projecting spit of sand about 2,000 feet in length, called "Narrows Beach," which makes out from the right bank, extending nearly across the creek and along the entire length of the bar and obstructing and deflecting the natural flow of the tidal currents. A shoal also extends out from Plumb Point, on the left bank of the creek, just below. The bar proper lying between these projecting points has a ruling depth of 4.3 feet, the best water being on the extreme right near "Narrows Beach." This is the channel used by vessels and it is quite tortuous and difficult to navigate. The distance between the 6-foot contours is 220 feet and between the 8-foot contours about 1,000 feet. In the center of the stream the bar is quite shoal, having a depth of but little more than 1 foot, while on the left the ebb tide has cut a channel nearly 6 feet deep well below Plumb Point. Borings taken at the bar show it to be composed chiefly of sand, with some admixture of mud, clay, and shells.

After passing Narrows Bar a depth of from 10 to 14 feet is found in the channel gradually shoaling to about 9 feet near Cupelo Point, 3 miles above the mouth, and thence to about 6 feet at Drum Bay, the head of navigation, 4 miles above the mouth. Above the Narrows the bottom is quite soft, and the stream could be navigated by vessels drawing a foot more than the depths above mentioned.

PLAN OF IMPROVEMENT.

The project for the improvement adopted November 29, 1892, provides for dredging a channel 150 feet wide and 9 feet deep at low tide, through the bar at the Narrows at an estimated cost of $15,000.

WORK DONE AND RESULTS OBTAINED.

The first appropriation for this work was made in the river and harbor act of July 13, 1892, the amount being $3,000. As no detailed survey of Narrows Bar had ever been made, it was necessary to make such a survey before a project and estimate for the improvement could be prepared. This survey was made in August, 1892. The report of the survey with map, estimates, and a project for the improvement were submitted November 22, 1892. The small appropriation of $3,000 made July 13, 1892, was not sufficient for dredging other than a narrow channel through the bar—estimated at 30 feet in width—to the full depth of 9 feet. Such a narrow channel as this would be of little benefit so far as steamboat navigation is concerned and would probably shoal before another appropriation was made. In order, however, to afford the relief asked by the citizens of this locality, the project provided for the application of the available funds to a channel 6 feet deep and 100 or more in width for temporary use until Congress should make further appropriations. Under date of February 13, 1893, proposals for dredging such a channel were invited by public advertisement. The bids were opened March 15, 1893, and an abstract of those received will be found hereto appended.

The contract was awarded to the lowest bidder, Fred. L. Somers, of Philadelphia, at 21 cents per cubic yard. The contract was entered into April 11, 1893, and approved April 13, 1893.

Dredging at Narrows Bar was commenced June 6, 1893, and at the close of the fiscal year was still in progress.

FUTURE OPERATIONS.

For the completion of the work under the project there will remain the additonal dredging required to secure a channel 150 feet wide and 9 feet deep through Narrows Bar, the estimated cost being $12,000.

APPROPRIATION.

The following appropriation has been made:

July 13, 1892	$3,000

The work is in the collection district of Tappahannock, which is the nearest port of entry. The nearest light-house is that at Blackistone Island.

Money statement.

Amount appropriated by act approved July 13, 1892		$3,000.00
June 30, 1893, amount expended during fiscal year		227.65
July 1, 1893, balance unexpended		2,772.35
July 1, 1893, outstanding liabilities	$86.00	
July 1, 1893, amount covered by uncompleted contracts	2,394.00	
		2,480.00
July 1, 1893, balance available		292.35
Amount (estimated) required for completion of existing project		12,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895		12,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for dredging at Lower Machodoc Creek, Virginia, opened March 15, 1893, at Washington, D. C., by Maj. Charles E. L. B. Davis, Corps of Engineers.

[11,400 cubic yards.]

No.	Name and address of bidder.	Price per cubic yard.	Amount.	Commence.	Complete.
		Cents.			
1	Fred. L. Somers, Philadelphia, Pa	21	$2,394	May 1, 1893	June 30, 1893
2	John P. Randerson, Albany, N. Y*	21	2,394	June 15, 1893	Aug. 1, 1893
3	Frank C. Somers, Camden, N. J	23½	2,679	July 31, 1893	Sept. 30, 1893

*Proposal conditional on his being awarded contract for work at Rappahannock River and Urbana Creek, Virginia.

Contract awarded to Fred. L. Somers and dated April 11, 1893.

COMMERCIAL STATISTICS.

[Furnished by Messrs. J. E. R. Crabbe and William Mayo, Hague, Va.]

Receipts and shipments, calendar year 1892.

	Tons.
Coal	120
Farm produce	160
Grain	1,500
Oysters	10,000
General merchandise	200
Railroad ties	2,000
Wood	750
Total	14,730

Number of vessels of various classes arriving and departing, calendar year 1892.

Steamers drawing less than 10 feet	52
Vessels drawing less than 10 feet	500
Barges, flatboats, etc	6,000

Great difficulty has been experienced in obtaining reliable commercial statistics for the smaller harbor improvements in this district, and the above are published as an illustration of this difficulty.

The same parties who furnished the above statistics, one of whom, Mr. William Mayo, is treasurer of the county, were written to before the survey was made to furnish statistics for use in preparing the report upon the survey, and at the time the shipment of oysters was stated at half a million bushels (about 20,000 tons), twice as great as given above. During the progress of the survey the assistant engineer in charge of the field party, from information obtained from storekeepers and citizens interested in the improvement, prepared the following estimate of the annual trade, which was inserted in the report upon the project for the improvement submitted November 22, 1892:

	Tons.
Grain	435
Oysters	375
Cord wood	500
Fruit and vegetables	200

It is thought that these are quite liberal estimates.

J 5.

IMPROVEMENT OF NOMINI CREEK, VIRGINIA.

ORIGINAL CONDITION.

Nomini Creek is an important tributary of the Potomac River, which it enters about 82 miles below Washington, D. C. At the date of the survey preliminary to the inception of the improvement (1872) its navigation was obstructed by a bar of oyster shells and sand at its mouth, over which but 3 feet could be carried at low tide. The dangers and difficulties of passing the bar were still further increased by strong cross tidal currents just inside the mouth at White Point. After passing the bar a wide and navigable stream is found, in which 8 feet can be carried for about 4 miles to Nomini Ferry, while 5 feet can be carried for about 6 miles above the mouth.

PLAN OF IMPROVEMENT.

The original project adopted in 1873 provided for dredging a channel through the bar 100 feet wide and 9 feet deep at low tide, with side slopes of 2 to 1, at an estimated cost of $20,000. The project was amended in 1879 by increasing the width to 150 feet, in order to meet the demands of increased trade. In 1885 the project was again modified so as to provide for a channel 200 feet wide and 9 feet deep, and also for dredging a training channel and the construction of training dikes. The total cost of this amended project was placed at $62,500. In 1888 this estimate was increased to $72,500, the channel having deteriorated during the suspension of work from 1883 to 1889. Owing to the position of the channel, exposed to north and northwest winds and to cross tidal currents, it is difficult to secure any permanent or satisfactory results. The deterioration of the channel outside White Point is believed to be largely due to material stirred up by northwest winds and carried into the channel by the ebb and flood currents of Currioman Bay. In order to maintain the channel and prevent this injurious action the project was modified in 1890 as follows: (1) The dredged channel to be 9 feet deep and 150 feet wide, this width being sufficient for navigation and more likely to hold its depth. (2) Two jetties to be constructed, one from White Point on the east and one from Cedar Island on the west of the dredged channel, to extend out into Nomini Bay parallel to the channel. (3) Dikes to be built inside White Point to check the cross currents, but the training channel to be omitted. It is estimated that this modified project can be completed at a total cost of $72,500, which was the amount of the revised estimate of 1888 for a 200-foot channel.

WORK DONE AND RESULTS OBTAINED.

From March 3, 1873, to August 2, 1882, seven appropriations were made ranging from $2,000 to $10,000, and aggregating $32,500. These appropriations were applied to dredging a channel through the bar, which at the close of work in 1883 was 100 feet wide, 9 feet deep, and 4,400 feet long. Operations were then suspended until 1889, when an appropriation of $5,000, made August 11, 1888, was expended in widening and deepening the channel outside White Point, which had partly filled in during the cessation of work. The river and harbor act of September 19, 1890, appropriated $5,000 for continuing the improvement. Under this appropriation dredging by contract, in accordance with the modified project, was commenced April 30, 1891, and completed June 19, 1891.

Ten thousand nine hundred and twenty-seven cubic yards of material were removed from the channel at and outside White Point, the depth made being 9 feet at low tide and the width 150 feet outside of White Point and 130 feet directly at White Point. The dredged material was removed in scows and deposited in Nomini Bay near Kingcopsico Point. The dike across the channel to Bushfield Bay, inside White Point, was built of riprap stone, 406 cubic yards having been purchased for this purpose.

In the river and harbor act of July 13, 1892, an appropriation of $10,000 was made for continuing the improvement. Under date of August 8, 1892, proposals were invited for oyster shells and riprap stone and for constructing the jetty on the east side of the channel outside White Point, and a contract for the same entered into with George W. Gray, of Georgetown, D. C.

The contractor commenced the excavation of the trench for the shore end of the jetty at White Point on December 10, 1892, but some material had been delivered at the site of the work before that date. Soon after this the Potomac was closed by ice, and operations remained suspended until February 20, 1893, when a barge load of stone arrived at the work and unloading was commenced. During the winter the trench had filled with sand, and it was therefore reëxcavated. The actual construction of the dike was commenced April 3, 1893. The dike consists of a hearting of oyster shells, covered with riprap stone to the depth of 18 inches. The top of the jetty is at high tide and is 6 feet in width. The side slopes have an inclination of 1½ to 1. Three-fourths of the riprap stone weigh from 400 to 1,000 pounds each and one-fourth from 100 to 400 pounds each.

On June 30, 1893, the construction of the jetty was in progress, the length completed being 200 linear feet.

FUTURE OPERATIONS.

The work remaining to be done under the project is the completion of the jetties and the continuation of the dredging to 150 feet width through the remainder of the bar. The total amount needed to complete the work is $20,000, and this can be profitably expended in one year.

APPROPRIATIONS.

The following appropriations have been made:

May 3, 1873	$10,000	August 2, 1882	$2,000
June 23, 1874	6,000	August 11, 1888	5,000
March 3, 1875	5,000	September 19, 1890	5,000
March 5, 1879	2,500	July 13, 1892	10,000
June 14, 1880	5,000		
March 3, 1881	2,000	Total	52,500

The work is in the collection district of Tappahannock, which is the nearest port of entry. The nearest light-house is that at Blackistone Island.

Money statement.

July 1, 1892, balance unexpended		$288.2
Amount appropriated by act approved July 13, 1892		10,000.0
		10,288.2
June 30, 1893, amount expended during fiscal year		1,665.3
July 1, 1893, balance unexpended		8,622.8
July 1, 1893, outstanding liabilities	$75.00	
July 1, 1893, amount covered by uncompleted contracts	7,658.00	
		7,733.0
July 1, 1893, balance available		889.8
Amount (estimated) required for completion of existing project		20,000.0
Amount that can be profitably expended in fiscal year ending June 30, 1895		20,000.0

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for furnishing oyster shells and riprap stone and constructing jet at Nomini Creek, Virginia, opened September 7, 1892, by Maj. Charles E. L. B. Davi Corps of Engineers.

No.	Name and address of bidder.	Oyster shells (1,800 cubic yards) per cubic yard.	Riprap stone (1,300 cubic yards) per cubic yard.	Total.	Commence.	Complete.
1	George W. Gray, Georgetown, D. C	$1.73	$5.19	$9,861	Oct. 15, 1892	Dec. 30, 18
2	Almos D. Neeld, Washington, D. C	3.00	8.50	16,450	May 1, 1893	Aug. 1, 18

Contract awarded to George W. Gray, and dated October 14, 1892.

COMMERCIAL STATISTICS.

Tonnage for calendar year—

	Tons
1889	13,5
1890	15,8
1891	62,3
1892	*21,0

No new lines of transportation were established in 1892. It is reported that t improvement has done very much toward lowering freight rates.

J 6.

IMPROVEMENT OF PATUXENT RIVER, MARYLAND.

ORIGINAL CONDITION.

The Patuxent River is navigable from its mouth at Drum Point, the Chesapeake Bay, for a distance of about 46 miles, as far as Brist Md. Vessels drawing from 10 to 12 feet can reach Holland Wha about 28 miles above the mouth, and a steamer drawing 8.5 feet wh fully loaded runs up to Bristol.

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* This calculation is for sailing vessels only. The steamers carry the great bu of grain and general merchandise.

Prior to the commencement of the improvement the navigation of the upper part of the river was obstructed by two mud bars (1) Swann Point Bar, about 43 miles above the mouth, with a ruling depth of 7.8 feet, and (2) Bristol Bar, at Bristol, with a least depth off the steamboat wharf of 7.6 feet, and 4.2 off the county wharf. Two other bars below, viz, Pope Shoal, about 24 miles above the mouth, and Warren Reach Bar, about 34 miles above the mouth, were mentioned in the report of the preliminary examination as worthy of survey, but they appear to offer no obstruction to the present standard of navigation.

PLAN OF IMPROVEMENT.

The original project proposed a cut of 200 feet wide and from 12 to 13 feet deep through these bars, so as to secure a permanent channel about 100 feet wide and 12 feet deep at low tide, at an estimated cost of $80,000. Under this project a channel 120 feet wide and 12 feet deep was dredged at Bristol Bar. Upon examination of the river in 1890, it appeared that a channel about 100 feet wide and 9 feet deep at Swann Point Bar would afford all the facilities that the existing or immediately prospective demands of commerce would require. The steamer navigating the upper part of the river draws, as stated, but 8.5 feet when fully loaded, but is, as a matter of fact, never fully loaded when passing this bar. So far as could be learned few sailing vessels go as high up as Bristol, and none drawing as much as 9 feet. The project was therefore modified so as to provide, in addition to the channel already dredged at Bristol Bar, a channel at Swann Point Bar about 100 feet wide and 9 feet deep, to be supplemented by works of contraction if these should afterward be found necessary.

WORK DONE AND RESULTS OBTAINED.

The first appropriation was made August 11, 1888, amounting to $5,000, which was applied to dredging by contract at Bristol Bar. A channel 12 feet deep, 120 feet wide, and 794 feet long was dredged from the 12-foot curve at the lower end of the bar to a point about 250 feet above the steamboat wharf. The amount of dredging was 18,295 cubic yards, and the channel was completed January 2, 1890. The material was mud.

In the river and harbor act of September 19, 1890, an appropriation of $6,000 was made for this improvement. Under this appropriation dredging by contract at Swann Point Bar was commenced April 9, 1891, and completed June 4, 1891. A channel 9 feet deep and 132 feet wide was dredged through the bar. This width of cutting will give a bottom width of fully 100 feet when the sides of the channel have assumed their natural slope. The total amount of dredging was 19,525.7 cubic yards, which was removed in scows. The dredged channel is about 2,250 feet long.

FUTURE OPERATIONS.

The work already done on this river is sufficient for its present trade and navigation. It is possible that works of contraction may be required to maintain the channel at Swann Point Bar, the bar being composed of mud; but this question can only be determined by surveys to be made in the future. If the trade of the river should increase so as to demand deeper-draft steamers and vessels a plan of improvement corresponding to these demands will be proposed, but at the present time no further appropriations are recommended.

APPROPRIATIONS.

The following appropriations have been made:

August 11, 1888	$5,00
September 19, 1890	6,0
	11,00

The work is in the collection district of Annapolis. The nearest light-house i that at Drum Point, Maryland.

Money statement.

July 1, 1892, balance unexpended	$920.8
June 30, 1893, amount expended during fiscal year	65.0
July 1, 1893, balance unexpended	855.8

COMMERCIAL STATISTICS.

Efforts were made to obtain commercial statistics, but the information receive was not sufficiently definite for use. It was reported, however, that the busines done in 1891 and 1892 was larger than it had been for many years.

J 7.

IMPROVEMENT OF RAPPAHANNOCK RIVER, VIRGINIA.

DESCRIPTION.

The Rappahannock River is navigable from its mouth in Chesapeak Bay to Fredericksburg, Va., a distance of 106 miles. The lower par of the river has the character of a tidal estuary, the width varyin from 1 to 3.5 miles. The ruling depth at the mouth is 5 fathoms, an this depth holds to Jones Point, 28 miles above, while 17 feet can b carried to within 1 mile of Tappahannock, which is 41 miles from th mouth. Above Tappahannock the river has a tortuous course, an above Port Royal, 29 miles from Fredericksburg, it flows between hig banks. The width at Fredericksburg is about 350 feet, graduall increasing to about 1,500 feet at Port Royal. In 1871, prior to th inception of the improvement, 6 feet could be carried within a mile o Fredericksburg, and then 4 feet to the town.

The Rappahannock River drains a large area of agricultural countr and is subject to freshets. The highest known freshet occurred i June, 1889, when the river rose to 32.8 feet above low tide at Fredericksburg. The freshet slope falls below Fredericksburg as the rive widens. Freshets are but little felt at Port Royal, and not at all a Tappahannock. They bring down large quantities of sediment, an are the chief factors in bar formation. Tides range from 2.5 feet at th mouth to 3.4 feet at Fredericksburg.

ORIGINAL CONDITION.

The obstructions to navigation lie between Tappahannock and Fredericksburg, 65 miles. The original condition of the bars was as follows:

Naylor Hole, 44 miles above the mouth. A detailed survey of the bar, made in 1885, showed the least depth to be 10.7 feet. The length of the bar between the 15-foot curves was 11,000 feet. Borings showed sand, mud, and gravel.

Nanzatico Reach, 72 miles above the mouth and 4 miles below Port Royal. The ruling depth on the bar is 10.1 feet (survey of 1885), although in the track which can be conveniently followed by steamers the depth is 8.3 feet. The length of the bar between the 15-foot curves is 5,540 feet. The bar is composed for the most part of soft mud.

Farleyvale Bar, 94 miles above the mouth, and 12 miles below Fredericksburg. In 1881, before improvement, 9 feet could be carried over this bar, although the depth on the best course was 8.3 feet. The bar was composed of sand, mud, and gravel, and was about 200 feet long between the 10-foot curves.

Castle Ferry Bar, 98 miles above the mouth, and 8 miles below Fredericksburg. The least depth in 1876, before improvement, was 8.4 feet, and the length between the 10-foot curves, 1,400 feet. The bar is composed of sand and mud.

Spottswood Bar, 102 miles above the mouth, 4 miles below Fredericksburg. In 1871 this bar was 5,400 feet long, with a least depth of 6 feet at the "cross over," where there were three wrecks sunk during the late war. Before improvement this was the most troublesome bar on the river below Fredericksburg Bar, and steamers often grounded here.

Pratt Reach Bar, 103 miles above the mouth and 3 miles below Fredericksburg. The ruling depth before improvement was 8.1 feet, and the length between the 10-foot curves about 1,000 feet. The bar is formed of sand and mud.

Bernard Bar, 104 miles above the mouth and 2 miles below Fredericksburg. The ruling depth before improvement was 9.1 feet, and the length between the 10-foot curves about 400 feet. The material is sand and gravel.

Pollock Bar, 105 miles above the mouth of the river and 1 mile below Fredericksburg. The bar was about 700 feet long in 1882, before its improvement was commenced, and the ruling depth 7 feet. At the head of the bar and near the right bank there was a ledge of rock on which the depth was from 6 to 7 feet.

Fredericksburg Bar.—This bar commences 1 mile below the railroad bridge at Fredericksburg, and extends up to and along the entire wharf front of the town to the bridge. The ruling depth in 1871 was 4 feet. The bar was formed and is constantly renewed by deposits of sand brought down by the recurring freshets. In 1871 six wrecks obstructed the channel over this bar.

The navigation of the Rappahannock is sometimes obstructed by trees and snags carried into the river by freshets.

PLAN OF IMPROVEMENT.

The original project, approved in 1871, was to secure a channel 100 feet wide and 10 feet deep by dredging and the construction of dikes from Fredericksburg to Tappahannock, the wrecks obstructing the channel to be removed. The first estimate of the cost of this improvement was $83,760. In 1879 the project was amended so as to provid for dredging a channel 100 feet wide and 10 feet deep through the bar between Fredericksburg and Port Royal, and one 200 feet wide and 1 feet deep between Port Royal and Tappahannock for a larger class o vessels. The depths secured by dredging were to be maintained by system of wing dams and training dikes. The total estimated cost o the revised project was $381,500.

WORK DONE AND RESULTS OBTAINED.

The first appropriation for the improvement was made March 3, 1871 amounting to $15,000. From March 3, 1871, to June 30, 1890, fourtee appropriations have been made, ranging from $5,000 to $25,000, an aggregating $199,500. These appropriations have been expended i improving the seven bars between Fredericksburg and Port Royal b dredging, the construction of dikes, and the removal of wrecks an snags.

The following table gives the results of the improvement at each o the bars at the date of the latest surveys.

Locality.	Depth at low water before improvement.	Ruling chan nel depth at low wate at date of latest surve
	Feet.	*Feet.*
Fredericksburg Bar, below steamboat wharf	4	8.4 (189
Pollock Bar	7.8	9 (189
Bernard Bar	8.5	9 (189
Pratt Bar	8.3	9 (189
Spottswood Bar, upper	6	9.4 (189
Spottswood Bar, lower	6	8.8 (189
Castle Ferry Bar	8	9.5 (189
Farleyvale Bar	8	9.5 (189

Nothing has yet been done toward the improvement of the bars a Nanzatico Reach, 33 miles below Fredericksburg, and at Naylor Hol near Tappahannock, 61 miles below Fredericksburg, as it is considere more important to first complete the improvement above.

Under the appropriation of $15,000 made in the river and harbor ac of September 19, 1890, the dikes at Fredericksburg Bar, Pollock Ba Bernard Bar, Spottswood Bar, and Castle Ferry Bar were repaired.

A combined steam-snagging and pile-driving plant was constructe (one-half of the cost being charged to Rappahannock River) and 18,02 cubic yards of sand dredged at Fredericksburg Bar.

An appropriation of $20,000 was made in the river and harbor act o July 13, 1892, for continuing the improvement. As the dimensions o channel called for by the project between Port Royal and Fredericksburg had not yet been attained, operations were directed to this par of the improvement. Surveys were made at Spottswood Bar and Fredericksburg Bar during August and September, 1892. At Spottswoo Bar an increase in the ruling depth was found to have taken place a the lower bar, which had increased from 8 feet in 1890 to 8.8 feet in 189

At Fredericksburg Bar, while a slight improvement had been effecte by the dredging of 1891, the greater part of the deposit of the fresh of 1889 and subsequent freshets remained to be removed.

The combined snagging and pile-driving plant which has been laid up during the suspension of active work at Leedstown, Va., was brought up the river, and 14 snags obstructing navigation between Fredericksburg and Port Royal were removed. The plant was then fitted up for pile-driving, and on September 28, 1892, work was commenced on the extension of Dikes No. 7, E and F at Fredericksburg Bar, to afford storage space for the sand to be dredged from the channel. The work was done by hired labor and the purchase of materials in open market. Operations were continued until December 22, 1892, when the river froze over and the suspension of work became necessary. The force was accordingly discharged and the plant placed in charge of a watchman.

An unusually severe winter followed, the ice forming to the thickness of 13 inches. On January 3 the ice broke up, and under the action of a freshet gorged somewhat below the railroad bridge. It soon froze again and so remained until February 10, 1893, when it began moving, so that on February 12, 1893, the river was entirely clear. Special precautions and expenditures were required to protect the plant and no injury resulted from the ice. The plant was overhauled, and slight repairs made and work on the dikes was resumed March 6, 1893. During the early spring continued rains and easterly winds caused high tides and consequent delay to the work. The dikes were completed April 15, 1893, with the exception of spiking some sheet piling which was done as soon as sufficiently low tides obtained. Seven hundred and eleven and six-tenths linear feet of dike were built.

The surveys made at Spottswood and Fredericksburg bars showed that further dredging operations at Spottswood could be deferred for the present, but that at Fredericksburg dredging would be required to restore the standard depth of 10 feet. As soon as the dikes behind which the dredged material was to be stored were sufficiently advanced preparations for the dredging were made. Specifications were prepared for dredging at Fredericksburg Bar, and bids for this work in connection with that at Urbana Creek were invited under date of February 13, 1893. The bids were opened March 15, 1893, and an abstract of the same will be found appended to this report. The contract for the two works was awarded to G. K. Baker, of Berkley, Va., and entered into March 27, 1893.

Dredging at Fredericksburg Bar was commenced on April 26, 1893, and on June 30, 1893, was still in progress.

FUTURE OPERATIONS.

The work remaining to be done under the project is the improvement of the two bars between Port Royal and Fredericksburg, and the dredging and dike construction necessary to secure and maintain a channel 10 feet deep and 100 feet wide through the seven bars between Fredericksburg and Port Royal. As each freshet brings new deposits of sand and silt into the river, particularly at Fredericksburg Bar, the head of tide water, an annual appropriation of about $7,500 will be required for its maintenance.

The increased expenditures at and near the head of navigation, due to this cause have so encroached upon the general estimate for the improvement of the river that a revision and increase of the same will soon become necessary.

APPROPRIATIONS.

The following appropriations have been made:

March 3, 1871	$15,000	March 3, 1881	$15,000
June 10, 1872	15,000	August 2, 1882	17,000
March 3, 1873	15,000	July 5, 1884	20,000
June 23, 1874	7,000	August 5, 1886	20,000
March 3, 1875	5,000	August 11, 1888 ($15,000, of which $3,000 was for Urbana).	12,000
August 14, 1876	10,000	September 19, 1890	15,000
June 18, 1878	13,500	July 13, 1892	20,000
March 3, 1879	10,000		
June 14, 1880	25,000	Total	234,500

The work is in the collection district of Tappahannock, which is the nearest port of entry. The nearest light-house is that at Blackistone Island.

Money statement.

July 1, 1892, balance unexpended		$2,969.59
Amount appropriated by act approved July 13, 1892		20,000.00
		22,969.59
June 30, 1893, amount expended during fiscal year		8,200.86
July 1, 1893, balance unexpended		14,768.73
July 1, 1893, outstanding liabilities	*$1,998.00	
July 1, 1893, amount covered by uncompleted contracts	11,395.00	
		13,393.00
July 1, 1893, balance available		1,375.73
Amount (estimated) required for completion of existing project		144,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895		25,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.		

Abstract of proposals for dredging at Rappahannock River and Urbana Creek, Virginia, opened March 15, 1893, at Washington, D. C., by Maj. Charles E. L. B. Davis, Corps of Engineers.

No.	Name and address of bidder.	Rappahannock River, 50,000 cubic yards.		Urbana Creek, 10,000 cubic yards.		Total.	Commence.	Complete.
		Per cubic yard.	Amount.	Per cubic yard.	Amount.			
		Cents.		*Cents.*				
1	G. K. Baker, Berkley, Va.	27	$13,500	16	$1,600	$15,100	April 1, 1893	Oct. 1, 1893.
2	Frank C. Somers, Camden, N. J.	26	13,000	27	2,700	15,700	On or before Aug. 15, 1893	Dec. 31, 1893.
3	John P. Randerson, Albany, N. Y.	32	16,000	21	2,100	18,100	On or before Aug. 1, 1893	On or before Dec. 15, 1893.
4	Fred. L. Somers, Philadelphia, Pa.	32	16,000	26	2,600	18,600	July 10, 1893	Jan. 31, 1894.

Contract awarded to G. K. Baker and dated March 27, 1893.

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* One thousand nine hundred and sixteen dollars and ninety-seven cents due on contract with George E. Ward, dated April 5, 1889.

COMMERCIAL STATISTICS.

Tonnage for—	Tons.
1888	83, 600
1890	83, 830
1892	*126, 333

No new lines of transportation were established during the year 1892.

The effect of the improvement thus far by increasing the facilities for navigation is shown in the lower freight rates prevailing where they are in competition with railroad transportation, and otherwise.

J 8.

IMPROVING URBANA CREEK, VIRGINIA.

ORIGINAL CONDITION.

Urbana Creek is a tributary of the Rappahannock River, which it enters 16 miles above the mouth. Navigation was obstructed in 1874 by a bar outside the mouth, over which but 6.5 feet could be carried. In 1882, after the improvement had been commenced, a shoal within the creek having a least depth of 7 feet, and near the town of Urbana, was regarded as an obstruction to steamboat navigation.

PLAN OF IMPROVEMENT.

The approved project, adopted in 1879, was the excavation of a channel 150 feet wide and 10 feet deep through the outer bar, at an estimated cost of $20,000. The project was modified in 1883 so as to include dredging a channel through the shoal within the creek, and in 1888 so as to include a system of dikes or jetties along the sand spit at the mouth, to prevent the natural channel from closing. The revised estimate for the entire project was $34,580.

WORK DONE AND RESULTS OBTAINED.

From March 3, 1879, to August 11, 1888, five appropriations, ranging from $2,500 to $5,000, and aggregating $18,500, were made and expended in dredging channels through the bar outside the mouth, and the shoal within the creek, and in the construction of dikes and jetties on the sand spit. From 1883 to 1889 work was suspended for want of funds.

In 1882 the channel through the outer bar had been dredged to a width of 140 feet and a depth of 10 feet, but owing to the action of storms and the cessation of work the width had diminished to 90 feet. The natural channel has been widened at the end of the sand spit and at the turn just outside the spit. A channel 10 feet deep and from 80 to 170 feet wide has been dredged at the shoal inside the creek. Two jetties and a dike have been built on the sand spit.

Under the appropriation of $3,000, made September 19, 1890, 5,674 cubic yards of material were dredged from the end of the sand spit and the width of the natural channel at this point increased 70 feet. The depth made was 10 feet at low tide. An appropriation of $3,000 was made July 13, 1892. A survey of the channel through the outer bar made in November, 1892, showed that shoaling had occurred, so that the depth ranged from 8.5 to 9.5 feet, while the width was about 110 feet. Proposals for deepening and widening the channel and for dredg-

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* Furnished by Mr. William D. Scott, Fredericksburg, Va.

ing at Fredericksburg Bar, Rappahannock River, under one contract, were invited by public advertisement, under date of February 13, 1893, and received on March 15, 1893. An abstract of the bids received will be found appended to the report on Rappahannock River. The contract was awarded to G. K. Baker, of Berkley, Va., and entered into March 27, 1893.

Dredging was commenced April 19, 1893. The plant employed by the contractor was old and worn-out, and frequent delays occurred from breakage of machinery and similar causes. Further delay resulted from the difficulty of procuring fresh water.

On June 30, 1893, a channel 10 feet deep and 120 feet wide was nearly completed through the outer bar. The work was chiefly redredging.

FUTURE OPERATIONS.

For the completion of the work under the existing project there remains the further dredging of the channel through the outer bar and the shoal within the creek and the construction of jetties. Owing to the exposed position of the outer bar it will be difficult to maintain a channel through it. Past experience shows that without protecting works a dredged channel must eventually shoal from the action of the east to northeast storms, while protecting works in such an exposed locality must necessarily be expensive. While the improvement made has been of benefit to navigation by permitting the entrance of sailing vessels to the creek, the steamers do not use the channel, but land at a wharf on the Rappahannock about 1.5 miles from the town. The pilots of steamers are opposed to entering the creek, as they find the bend in the natural channel just outside the spit difficult, if not dangerous, in northeast and northwest winds. If this improvement is to be continued, larger appropriations should be made. The amount required to complete the existing project is $10,080.

APPROPRIATIONS.

The following appropriations have been made:

March 3, 1879	$5,000
June 14, 1880	2,500
March 3, 1881	4,000
August 2, 1882	4,000
August 11, 1888 (included in an appropriation of $15,000 for Rappahannock River)	3,000
September 19, 1890	3,000
July 13, 1892	3,000
Total	24,500

Urbana is a port of entry in the collection district of Tappahannock. The nearest light-house is that at Bowler Rock.

Money statement.

July 1, 1892, balance unexpended		$1,140.96
Amount appropriated by act approved July 13, 1892		3,000.00
		4,140.96
June 30, 1893, amount expended during fiscal year		1,847.44
July 1, 1893, balance unexpended		2,293.52
July 1, 1893, outstanding liabilities	$149.00	
July 1, 1893, amount covered by uncompleted contracts	1,841.00	
		1,990.00
July 1, 1893, balance available		303.52

Amount (estimated) required for completion of existing project	$10,080.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	10,080.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

COMMERCIAL STATISTICS.

Tonnage for calendar year—	Tons.
1890	5,350
1891, reported by Mr. F. A. Bristow as	19,500
reported by Mr. J. D. Cressit as	22,100
1892	20,095

Arrivals and departures of vessels, 1892.

	No.	Tonnage.
Steamers drawing less than 10 feet	8	1,200
Sailing vessels drawing less than 10 feet	200	8,000
Barges, flatboats, etc	5	1,500

No new lines of transportation have been established during the year.

J 9.

IMPROVEMENT OF YORK RIVER, VIRGINIA.

ORIGINAL CONDITION.

The York River is formed by the union of the Mattaponi and Pamunkey rivers at West Point, Va., is 41 miles in length, and empties into Chesapeake Bay about 16 miles above Old Point. Entering the river 24 feet can be carried for 32 miles up to Potopotank Bar, 9 miles below West Point. In 1880 the ruling depth on this bar was 18.5 feet, and its length between the 20-foot curves was 2,200 feet. The next obstruction to navigation is West Point Bar, which commences about 2 miles below West Point and extends up to West Point, with a ruling depth of 15.5 feet. West Point is the shipping point of the Richmond and West Point Terminal Railroad system. The wharves from which shipments are made are built within the mouth of the Pamunkey River, and further obstruction to navigation was found in shoal water in front of these wharves.

PLAN OF IMPROVEMENT.

The original project adopted in 1880 proposed the dredging of a channel 22 feet deep and 200 feet wide through the bars at Potopotank and West Point, with an increased width at the wharves at West Point. In 1884, on account of the increased trade, the project was modified by increasing the width of the proposed channel to 400 feet, at a total estimated cost of $256,000. In 1887 the project was again amended to include the construction of a dike along the right bank of the river at West Point Bar, in order to prevent the deposit of silt in the dredged channel. The estimated cost of this dike was $52,800, making the total estimated cost of the improvement $308,800.

WORK DONE AND RESULTS OBTAINED.

From June 14, 1880, to August 11, 1888, six appropriations, ranging from $10,000 to $30,000, and aggregating $128,750, were made for this improvement.

Up to June 30, 1890, the following work had been done: A channel 105 feet wide and 22 feet deep was dredged in 1880–'81 through Potopotank Bar, 58,809 cubic yards of material having been dredged, at 15 cents per cubic yard. This channel in January, 1890, had a depth of from 20.8 to 21.7 feet.

At West Point Bar 795,704 cubic yards were dredged from 1881 to 1889, under successive appropriations, at rates varying from 8.5 to 16 cents per cubic yard, which gave a channel through the bar with a width varying from 161 to 257 feet, and a depth, exclusive of the center cut, of not less than 22 feet. Under a modification of the project by the Secretary of War, January 4, 1889, a cut of 40 feet wide and 24 feet deep was dredged near the center of the channel from the lower wharf at West Point to the second turn in the channel. In January, 1890, the ruling depth in this cut had been reduced by silting to 20.6 feet and in the rest of the channel to 19 feet. From the commencement of the improvement in 1881 to June 30, 1890, it had been necessary to redredge 152,595 cubic yards of silting which was not provided for in the original estimate, or about one-fifth of the total amount dredged at West Point Bar.

Under the appropriation of $30,000, made September 19, 1890, 166,130 cubic yards of material were dredged from the channel at West Point Bar, of which 95,173 cubic yards were redredging. A channel 160 feet wide, 22 feet deep, and 2,700 feet long was dredged in front of the West Point wharves, and the channel between and near Buoys 13 and 15 was redredged for a distance of about 3,300 feet, the width made being 160 feet and the depth 22 feet. Up to June 30, 1893, the total amount of dredging at West Point Bar was 961,834 cubic yards, of which 247,768 cubic yards were redredging. It was evident from this result that early action must be taken in the matter of constructing the dike proposed in the project in order, if possible, to prevent further deposits in the dredged channel.

On July 13, 1892, a further appropriation of $35,000 was made, which, together with a balance reserved from the appropriation of September 19, 1890, was allotted to the construction of the dike at West Point Bar on the right of the channel. A survey of the West Point Bar was made in September, 1892, and test piles driven near the proposed line of dike. The survey showed a ruling depth of practically 20 feet, and indicated that the shoaling still continued.

During the following winter plans and specifications for the dike were prepared, and under date of February 13, 1893, proposals for the work were invited by public advertisement. Bids were opened on March 15, 1893, and an abstract of those received will be found appended to this report.

The contract was awarded to Sanford and Brooks, of Baltimore, Md., and entered into March 29, 1893. The construction of the dike was commenced May 24, 1893, and at the close of the fiscal year was still in progress.

FUTURE OPERATIONS.

Future operations proposed are the completion of the channels at West Point and Potopotank bars, and of the dike at West Point Bar, in order to maintain the channel secured by dredging.

Occupants of oyster beds on these flats object to the dumping of material and the construction of the dike and claim that it will injure their oyster beds.

On the basis of the original estimate the amount required for the completion of the project is $115,050, but owing to the continued shoaling of the channel this amount will probably be insufficient.

The trade of the York River is large, increasing, and important, and the improvement is worthy of liberal appropriations by Congress.

APPROPRIATIONS.

The following appropriations have been made:

June 14, 1880	$10,000
March 3, 1881	25,000
August 2, 1882	25,000
July 5, 1884	20,000
August 5, 1886	18,750
August 11, 1888	30,000
September 19, 1890	30,000
July 13, 1892	35,000
Total	193,750

This work is in the collection district of Richmond, which is the nearest port of entry. The nearest light-house is Bell Rock, in the fifth light-house district.

Money statement.

July 1, 1892, balance unexpended		$12,825.82
Amount appropriated by act approved July 13, 1892		35,000.00
		47,825.82
June 30, 1893, amount expended during fiscal year		2,353.42
July 1, 1893, balance unexpended		45,472.40
July 1, 1893, outstanding liabilities	$90.00	
July 1, 1893, amount covered by uncompleted contracts	37,690.00	
		37,780.00
July 1, 1893, balance available		7,692.40
Amount (estimated) required for completion of existing project		115,050.00
Amount that can be profitably expended in fiscal year ending June 30, 1895		100,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for constructing dike at York River, Virginia, opened March 15, 1893, at Washington, D. C., by Maj. Charles E. L. B. Davis, Corps of Engineers.

No.	Name and address of bidder.	Class A (4,000 linear feet), per linear foot.	Class B (3,500 linear feet), per linear foot.	Amount.	Commence.	Complete.
1	Sanford & Brooks, Baltimore, Md.	$4.68	$5.42	$37,690	20 days after signing contract.	In 6 months.
2	Mark O. Haskins & T. G. Janney, Rio Vista, Va.	5.98	6.98	48,350	May 1, 1893	Sept. 15, 1893.
3	James M. Douglas, Baltimore, Md.	5.92	7.09	48,495	Apr. 15, 1893	Oct. 15, 1893.
4	John A. Curtis, Richmond, Va.	6.85	6.95	51,725	May 1, 1893	Dec. 31, 1893.
5	C. P. Grim, Philadelphia, Pa.	6.95	7.93	55,555	Within 30 days.	In 5 months.
6	H. K. Culpepper, Portsmouth, Va.	7.77	7.83	58,485	Apr. 25, 1893	Jan. 1, 1894.
7	Edwin Wilkinson & W. H. Roark, West Point, Va.	*7.60	†8.38	‡54,735	May 1, 1893	Dec. 1, 1893.

* For less than 4,000 linear feet.

† For less than 3,500 linear feet.

‡ Amount bid for entire work: For Class A, $27,770; for Class B, $26,965 = $54,735.

Contract awarded to Sanford & Brooks and dated March 29, 1893.

COMMERCIAL STATISTICS.

[Furnished by Mr. E. T. Lamb, West Point, Va.]

Class of goods.	1891.	1892.
	Tons.	*Tons.*
Coal	10, 960	10, 498
Cotton	89, 227	63, 742
Farm produce	5, 641	3, 500
Grain	3, 220	....
Iron	43, 897	45, 501
Lumber	7, 848	6, 081
Oysters	12. 400	2, 780
General merchandise	70, 355	191, 462
Railroad ties	14, 140	5, 000
Tobacco	175	8, 500
Wood	45, 900	8, 495
Resin	100	....
Oil	475	....

Vessels arriving and departing.

	1891.	1892.
	No.	*No.*
Steamers drawing 10 feet or more	727	724
Steamers drawing less than 10 feet	104	208
Vessels drawing 10 feet or more	178	96
Vessels drawing less than 10 feet	824	190
Barges, flatboats, etc	191	18

Statement of tonnage by years.

Reported for—	Tons.
1888	285, 480
1889	328, 353
1890	418, 190
1891	304, 338
1892	345, 559

No new lines of transportation were established in 1892; but it is reported that the established lines have increased their service, giving much better satisfaction, and that the work done has benefited shipping to a great extent.

J 10.

IMPROVEMENT OF MATTAPONI RIVER, VIRGINIA.

The Mattaponi River is navigable for small steamers and vessels from its mouth at West Point to Ayletts, a distance of about 52 miles, and can be made navigable for barges for 26 miles above Ayletts, to Munday Bridge. The obstructions to 5.5-foot navigation below Ayletts are as follows:

Designation.	Approximate distance below Ayletts.	Length of bar.	Ruling depth.
	Miles.	*Feet.*	*Feet.*
Latane Bar	11	2, 900	3. 6
Robinson Bar	8	3, 500	3. 4
Presque Isle Bar	7	1, 200	2. 0
Sale Bar	6½	800	2. 0
Walker Bar	4	1, 000	2. 5
Old Hall Bar	1	900	2. 5

Of the above-named bars only the first two have been surveyed, and the lengths and depths at the others are approximate only. Above Ayletts there were eight bars, but no work on them was proposed. The river was also obstructed by snags, overhanging trees, and wrecks.

PLAN OF IMPROVEMENT.

The original project adopted in 1880 provided for the removal of snags, logs, leaning trees, wrecks, etc., below Munday Bridge and the improvement of the bars below Ayletts, so as to give a depth of 5.5 feet at low tide and a channel width of 40 feet.

This project was amended by the terms of the river and harbor act of July 13, 1892, so as to provide for the removal of snags up as far as Guineas Bridge, near Milford Station, on the Richmond, Fredericksburg and Potomac Railroad.

WORK DONE AND RESULTS OBTAINED.

From June 14, 1880, to August 11, 1888, five appropriations, ranging from $2,500 to $5,000 and aggregating $16,300, had been made for this work and the entire amount expended. On June 30, 1890, the following results had been obtained: Snags, wrecks, and overhanging trees had been removed from Robinson Bar to Munday Bridge, a distance of about 34 miles, and 2,226 linear feet of dike had been built at Robinson Bar. No dredging has yet been done on the river.

The appropriation of $3,000, made September 19, 1890, was applied in part to the construction of a plant consisting of a combined snag boat and pile-driver, with scows, etc., to be used on the Mattaponi, Pamunkey, and Rappahannock rivers, and in part to the removal of 402 snags, logs, and overhanging trees between West Point and Dunkirk.

On July 13, 1892, an appropriation of $4,000 was made, as follows: "Improving Mattaponi River, Virginia: Continuing improvement, $4,000, of which $1,500 shall be expended between Ayletts and Guineas bridges."

The plant which had been employed in dike construction on Rappahannock River was transferred to the Mattaponi River in May, 1893, and the removal of snags and similar obstructions to navigation commenced. At the close of the fiscal year this work was still in progress.

FUTURE OPERATIONS.

The remaining work under the existing project is as follows: The completion of the dikes at Robinson Bar and the construction of those proposed at Latane Bar, and the dredging of channels at all of the bars below Ayletts having a ruling depth of less than 5.5 feet. Snags and fallen trees accumulate each year and will require removal. The estimated amount required for the completion of the existing project is $48,800, but as instrumental surveys have been made of but two bars this estimate will be subject to future revision.

APPROPRIATIONS.

The following appropriations have been made:

June 14, 1880	$2,500
March 3, 1881	3,300
July 5, 1884	2,500
August 5, 1886	5,000
August 11, 1888	3,000
September 19, 1890	3,000
July 13, 1892	4,000
Total	23,300

The work is in the collection district of Richmond, which is the nearest port of entry. The nearest light-house is Bell Rock, Virginia.

Money statement.

July 1, 1892, balance unexpended	$132.61
Amount appropriated by act approved July 13, 1892	4,000.00
	4,132.61
June 30, 1893, amount expended during fiscal year	930.91
July 1, 1893, balance unexpended	3,201.70
July 1, 1893, outstanding liabilities	336.00
July 1, 1893, balance available	2,865.70
Amount (estimated) required for completion of existing project	48,800.00
Amount that can be profitably expended in fiscal year ending June 30, 1895.	10,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

COMMERICAL STATISTICS.

Receipts and shipments.

Class of goods.	Calendar years.		
	1890.	1891.*	1892.*
	Tons.	*Tons.*	*Tons.*
Farm products		2,400	
Grain		1,000	
Lumber	7,700	1,200	5,500
Merchandise	10,400	3,120	15,570
Ties	6,900	5,640	5,000
Wood	7,650	38,700	6,620
Total	32,650	52,060	32,690

*Furnished by Mr. E. T. Lamb, West Point, Va.

Vessels arriving and departing during 1892.

Designation.	No.	Tonnage.
Steam, drawing less than 10 feet	208	10,400
Sail, drawing 10 feet or more	70	27,000
Sail, drawing less than 10 feet	43	8,600
Barges, flatboats, etc	18	1,250

No new lines of transportation were established during the year.

J II.

IMPROVEMENT OF PAMUNKEY RIVER, VIRGINIA.

The Pamunkey River is navigable from its mouth at West Point, on the York River, to Hanovertown or Dabney Ferry, a distance of about 59 miles. Seven feet can be carried to Piping Tree Ferry, a distance of 43 miles. The following are the principal bars obstructing navigation:

Designation.	Distance above West Point.	Length of bar.	Least depth.
	Miles.	*Feet.*	*Feet.*
Spring Bar	43.5	700	5.6
Skidmore Bar	47.5	600	5.8
Whaleback Bar	53.5	700	3
Totomoy Creek	56	400	1.5
Indian Table	58	....	(*)

*Exposed at low tide.

In addition to these bars, navigation was originally obstructed by numerous wrecks, logs, snags, and overhanging trees.

PLAN OF IMPROVEMENT.

The project for the improvement, adopted in 1880 and amended in 1885, provided for 7-foot navigation from West Point to Bassett Ferry, 47 miles; thence 5-foot navigation to Wormley Landing, 54 miles above West Point, and thence 3-foot navigation to Hanovertown, the 7-foot channel to be 100 feet wide and the remainder 40 feet wide. The wrecks snags, logs, and trees obstructing navigation between Garlick Ferry and Hanovertown were also to be removed.

WORK DONE AND RESULTS OBTAINED.

From June 14, 1880, to August 11, 1888, five appropriations were made, ranging from $2,500 to $5,000, and aggregating $15,500. The following work has been done: Snags, logs, and overhanging trees have been removed from the river between Hanovertown and Garlick Ferry, a distance of 22.5 miles. Parts of wrecks obstructing navigation have been removed as follows: Three at Skidmore Bar, three at Carter Island, and one at White House. Nine hundred and eleven feet of dike have been constructed at Skidmore and Spring bars, and a channel 800 feet long, 95 feet wide, and from 6 to 7 feet deep has been dredged through Skidmore Bar.

The appropriation of $3,000, made September 19, 1890, was applied in part to the construction of a new plant consisting of a combined snag boat and pile-driver with scows, etc., for use on the Pamunkey, Mattaponi, and Rappahannock rivers, and in part to the removal of 243 snags, logs, and overhanging trees obstructing navigation. On July 13, 1892, a further appropriation of $3,000 was made. No work has yet been done under the appropriation, as the plant has been engaged on the Rappahannock and Mattaponi rivers since the funds were available.

FUTURE OPERATIONS.

The work remaining to complete the project is the dredging of channels at Spring Bar and at the three unimproved bars above, with such further work in removing obstructions as may be found necessary. The estimated cost of completing the project is $7,000, and if dredging operations are to be resumed, this amount should be appropriated at one time. It is not improbable that, owing to the cost of snagging operations and the plant therefor and the small appropriations heretofore made, the cost of the work may be greater than the present estimates.

APPROPRIATIONS.

The following appropriations have been made:

June 14, 1880	$2,500
March 3, 1881	2,500
August 2, 1882	2,500
August 5, 1886	5,000
August 11, 1888	3,000
September 1, 1890	3,000
July 13, 1892	3,000
Total	21,500

The work is in the collection district of Richmond, which is the nearest port of entry. The nearest light-house is Bell Rock, Virginia.

Money statement.

July 1, 1892, balance unexpended	$53.34
Amount appropriated by act approved July 13, 1892	3,000.00
	3,053.34
June 30, 1893, amount expended during fiscal year	53.34
July 1, 1893, balance unexpended	3,000.00
Amount (estimated) required for completion of existing project	7,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	7,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

COMMERCIAL STATISTICS.

Efforts were made to obtain commercial statistics, but the information received was not sufficiently definite for use.

J 12.

PRELIMINARY EXAMINATION OF MOUTH OF PARISH CREEK, MARYLAND.

[Printed in House Ex. Doc. No. 106, Fifty-second Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 6, 1892.

SIR: I have the honor to submit the accompanying copy of report dated November 30, 1892, by Maj. Charles E. L. B. Davis, Corps o Engineers, upon preliminary examination of the mouth of Parish Creek, Maryland, made to comply with provisions of the river and harbor act approved July 13, 1892.

Maj. Davis reports that in his opinion Parish Creek is not worthy o improvement by the General Government, and, for the reasons given by the local engineer, the division engineer concurs in this opinion.

In the judgment of this office the mouth of Parish Creek is not worthy of improvement by the United States.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

Hon. S. B. ELKINS,
Secretary of War.

REPORT OF MAJ. CHARLES E. L. B. DAVIS, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Washington, D. C., November 30, 1892.

GENERAL: In compliance with the instructions contained in Department letter of July 14, 1892, I have the honor to submit the following report of a preliminary examination of the mouth of Parish Creek, Maryland, made on November 14, 1892, to comply with the provisions of the river and harbor act approved July 13, 1892.

Parish Creek, Maryland, is a very small arm of West River, the latter being a tidal estuary of Chesapeake Bay, which it enters on the west side at Curtis Point, 12 miles (by water) below Annapolis, Md. Parish Creek is situated on the south side of West River, the mouth of the creek being about 1,000 yards inside or southwest of Curtis Point. The width at the mouth is about 1,400 feet, while within the creek is only about three-fifths of a mile long and from 600 to 1,400 feet in width. The soundings in the creek, given upon the Coast Survey map of 1846, show depths varying from 3 to 5 feet at low tide, while at the mouth a depth of 3 feet is given. Since the date of this map, however, the depth at the mouth has decreased by the formation of a bar which is practically dry at low tide, so that the small oyster boats drawing 18 inches can not then pass over it. On the occasion of my visit to this locality I had an interview with one of the citizens who requested the examination, who informed me that there were some 200 small oyster boats belonging in Parish Creek and that 13 bugeyes and sloops drawing from 4 to 6 feet traded from there. There are three stores on the creek. I requested that a written statement of the amount and value of the annual trade be furnished me, but it has not been received.

The improvement desired is, I was informed, a channel 80 feet wide and from 7 to 8 feet deep, to enable a steamboat to enter the creek, and also to permit the oyster boats and sloops to enter at night and find shelter during storms. So far as facilities for steamboat navigation are concerned, I may say that there is one steamer which plies between Baltimore and Annapolis and landings on West River, making three trips a week. This steamer stops at two wharves near the head of the river, the one on the side nearest Parish Creek being known as Chalk Point, which is distant from the creek about 3 miles by water and 5 miles by road. The representative of the steamboat line whom I consulted did not express any desire to go into Parish Creek and would prefer not to do so. The presumption is that there is not much trade there other than in oysters, which are carried to Baltimore in the small bugeyes and sloops. It appears, therefore, that the improvement here desired is really for the accommodation of the small boats which go out to tong oysters and the sailing vessels which take the oysters to market. I take it, however, that the system of river and harbor improvements as carried on by the United States is not intended to provide for navigation of this character or for interests so clearly local.

Moreover, the oyster industry is especially fostered by the State of Maryland, which has an elaborate system of laws for its regulation.

No steamer is allowed to be used in catching oysters in the waters of the State, and no other boat without first being licensed.

The comptroller of the treasury is authorized to issue licenses upon the application of any person who has been a resident of the State for twelve consecutive months next preceding such application, to employ such boat in taking or catching oysters with scoop, dredge, or similar instrument within the waters of Chesapeake Bay within certain specified limits.

Certain fines and penalties are established for specified offenses. For instance, it is made unlawful to take or catch oysters on Sunday or at night under penalty of a fine not less than $50 or more than $300, or a sentence to the house of correction of not less than three months nor more than one year, the vessel or canoe to be forfeited at the discretion of the judge or justice of the peace trying the case.

All the moneys received or obtained from dredging licenses and all fines, penalties, and forfeitures are to be paid into the treasury and placed to the credit of a fund called "the oyster fund," to be used in maintaining the proper police for the protection of the industry.

It would appear, therefore, that any relief which is needed for the oyster industry should properly be granted by the State of Maryland.

In view of the above considerations I respectfully report that, in my opinion, Parish Creek is not worthy of improvement by the General Government.

Very respectfully, your obedient servant,

CHAS. E. L. B. DAVIS,
Major, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. William P. Craighill, Corps of Engineers, Division Engineer, Southeast Division.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., December 5, 1892.

Respectfully submitted to the Chief of Engineers.

For the reasons given by the local engineer I concur with him in the opinion that this locality is not "worthy of improvement by the General Government."

WM. P. CRAIGHILL,
Colonel, Corps of Engineers.

J 13.

PRELIMINARY EXAMINATION OF WICOMICO RIVER, MARYLAND, WESTERN SHORE OF THE STATE.

[Printed in House Ex. Doc. No. 63, Fifty-second Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 5, 1892.

SIR: I have the honor to submit the accompanying copy of report dated November 25, 1892, by Maj. Charles E. L. B. Davis, Corps of Engineers, upon preliminary examination of Wicomico River, Maryland, western shore of the State, made in accordance with provisions of the river and harbor act approved July 13, 1892.

Maj. Davis reports that after a careful consideration of all the facts which he has been able to obtain he is of the opinion that the present and prospective demands of commerce are not such as to render the Wicomico River worthy of improvement by the General Government.

For the reasons given in this report Col. William P. Craighill, Corps of Engineers, the division engineer, agrees that this stream is not worthy of improvement by the General Government, and I concur in this opinion.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

Hon. S. B. ELKINS,
Secretary of War.

REPORT OF MAJ. CHARLES E. L. B. DAVIS, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Washington, D. C., November 25, 1892.

GENERAL: In compliance with the instructions contained in Department letter of July 14, 1892, I have the honor to submit the following report of a preliminary examination of Wicomico River, Maryland, western shore of the State, made on September 29, 1892, to comply with the provisions of the river and harbor act approved July 13, 1892.

Wicomico River, Maryland, western shore of the State, is a tidal estuary of the Potomac River which it enters on the left about 75 miles below Washington, D. C. It is the largest of the numerous estuaries of the Potomac, being about 13 miles in length from its head at Allen's Fresh to its mouth at Cob Point. The width varies from about 1 mile near the head to 2 miles at the mouth. The width generally, however, is about 1½ miles. The channel at the mouth has a depth of 43 feet, gradually decreasing to 20 feet at a distance of 4 miles above. Thence for a further distance of 3 miles the depth varies from 12 to 16 feet, but the channel is thickly interspersed with small shoals or "oyster rocks" on which there are depths of from 4 to 5 feet, so that unless these shoals were well marked by buoys, the navigation would be difficult as well as dangerous. At a distance of 7 miles above the mouth is Chaptico Bay, a wide but shallow prong of the estuary, which extends about 2 miles to the northeastward.

On the lower side of the junction of Chaptico Bay with the main river is Mills Point, from which a shoal (with a depth of from 1 to 3 feet) makes out for three-fourths of a mile into the main river, which is here 1½ miles wide. Nine feet can be carried to a point 8 miles above the mouth and 6 feet can be carried for a distance of 9 miles above the mouth. The river then becomes quite shallow, the depths ranging from 3 to 4 feet. The depths above given are from the Coast Survey map of 1860–'68. One of the citizens who request an improvement of the river states, however, that there has been considerable shoaling during the last twenty years above Mills Point and the mouth of Chaptico Bay. The soundings taken during the examination indicate that such might be the case.

At the entrance to the river there is a light-house situated on the end of Cob Point Bar, while the lower part of the river affords a safe harbor during northeast storms for the largest vessels navigating the Potomac.

There are three wharves on the river, viz: Lancaster's Wharf, or Rock Point, on the right shore, 1½ miles above the mouth; Plowden's Wharf, or Brushwood, on the left, 2½ miles above the mouth; and Chaptico Wharf, on the left, 5¼ miles above the mouth. Landings are made at all of these wharves by two steamers of the Maryland and Virginia Steamboat Company, plying between Baltimore and Washington, and at the two lower wharves by one steamer of the Washington Steamboat Company, Limited, plying only between Washington and Potomac River landings.

The river contains many oyster beds, and the taking of oysters appears to be an extensive industry. An oyster-canning establishment at Lancaster's Wharf is in operation during the oyster season.

The improvement desired by the citizens who requested the examination is the opening of a channel, 8 feet deep, through the interlocking bars above Chaptico Wharf and the shoals toward the head of the river. The dredging of a channel through Mills Point Bar was requested, to shorten the distance in going up the river, above Chaptico Wharf. Aside from the fact that such a channel would probably not remain open if dredged, it is quite unnecessary; for, as stated above, while Mills Point Bar extends three-fourths of a mile into the river, there still remains an equal width of river in which the main channel is found with a depth of 10 to 12 feet, except on the oyster rocks. The next bar which can be termed an interlocking bar is at Stoddards Point, nearly 2 miles above, so that, so far as these bars are concerned, a light-draft steamer or vessel can readily make a detour and pass the ends of them if the shoals and oyster rocks are well buoyed.

The statement of trade to be benefited by the proposed improvement was given me as follows: Wheat, 20,000 bushels, or 600 tons; tobacco 5,000 hogsheads, or 2,250 tons; besides cattle and produce.

I am inclined to think, however, that these figures must be somewhat overestimated, inasmuch as the entire annual production of wheat in the two counties of Charles and St. Marys, which border on the river, as given by the census returns of 1880, was 263,810 bushels in a total farm area of 230,530 acres, and that it is quite improbable that one-thirteenth of this amount is shipped from the small area tributary to the upper part of the Wicomico. Similarly the annual production of tobacco in these two counties in 1880 was 9,574,825 pounds, or, assuming 900 pounds as the average weight of a hogshead, 10,639 hogsheads. That one-half of the production of these two counties should be shipped from this small area is of course quite out of the question. It is evident, therefore, that very large reduction must be made from the above figures; just how much I am, of course, unable to say.

With a view to ascertaining if there were any demand for additional facilities for steamboat navigation on the river, I addressed letters to the representatives of both companies navigating the river, making inquiry on this point. The replies indicate that no work is needed in this regard.

Indeed, the people interested stated that they desired to facilitate the access of sailing vessels to the upper part of the river. It is fair to assume, however, that if there were much trade there the steamboat companies would express some wish to reach it.

After a careful consideration of all the facts which I have been able to obtain, I am of the opinion that the present and prospective demands of commerce are not such as to render the Wicomico River worthy of improvement by the General Government.

Very respectfully, your obedient servant,

CHAS. E. L. B. DAVIS,
Major, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. William P. Craighill, Corps of Engineers, Division Engineer, Southeast Division.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., November 26, 1892.

Respectfully submitted to the Chief of Engineers.

For the reasons given by the local engineer, I agree in the opinion that this stream is not "worthy of improvement by the General Government."

WM. P. CRAIGHILL,
Colonel, Corps of Engineers.

J 14.

PRELIMINARY EXAMINATION OF LITTLE WICOMICO RIVER, VIRGINIA, OBSTRUCTION AT MOUTH.

[Printed in House Ex. Doc. No. 137, Fifty-second Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 16, 1892.

SIR: I have the honor to submit the accompanying copy of report, dated December 14, 1892, by Maj. Charles E. L. B. Davis, Corps of Engineers, of the results of a preliminary examination of the mouth of Little Wicomico River, Virginia, made to comply with provisions of the river and harbor act approved July 13, 1892.

It is the opinion of Maj. Davis, concurred in by the division engineer and by this office, that the locality is not worthy of improvement by the General Government.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

Hon. S. B. ELKINS,
Secretary of War.

REPORT OF MAJ. CHARLES E. L. B. DAVIS, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Washington, D. C., December 14, 1892.

GENERAL: In compliance with the instructions contained in Department letter of July 14, 1892, I have the honor to submit the following report of a preliminary examination of "Little Wicomico River, Virginia, obstruction at mouth," to comply with the provisions of the river and harbor act approved July 13, 1892.

Little Wicomico River is situated in Northumberland County, Va., and is, strictly speaking, a tidal estuary of the Potomac River, into which it now empties on the southwesterly (or right) side, about 1 mile above Smiths Point, the southwesterly point of the confluence of the Potomac River and Chesapeake Bay. The outlet of the river is, however, substantially on Chesapeake Bay, and is exposed to the full force of northeast storms, which, off the mouth of the Potomac, are very severe, winds from this quarter having a reach of some 17 miles. Little Wicomico River is from 4 to 5 miles long, has a varying width of from 600 to 1,500 feet, with banks from 12 to 15 feet high, and flows in an easterly direction. It has numerous branches whose lengths vary from one-half to 1½ miles, which, together with the many bays and indentations, give the river that peculiarly jagged and irregular outline so characteristic of the tidal estuaries of Chesapeake Bay.

In 1856 there existed another outlet to the river one-half of a mile south of Smiths Point and shown upon the Coast Survey map of that date. This was formerly the only outlet, the northern or present outlet having been opened about 1840, when, during a severe northeast storm, the high tides swept over the beach and cut a new channel, which gradually deepened under the action of the tidal currents. Meanwhile the southern outlet gradually shoaled and became entirely closed in 1868. In 1874 the beach at this point was about 400 feet wide and from 5 to 6 feet above low tide.

As might be inferred from the conditions under which it was opened, the mouth of the river is obstructed by a bar which is, in fact, a part of the extensive shoal which extends from Smiths Point out into Chesapeake Bay for a distance of over 2 miles, the width of this shoal being nearly equal to its length.

This shoal must necessarily be crossed by any vessel or steamer attempting to reach Little Wicomico River. While from 8 to 10 feet can be carried over the greater part of the shoal, it is evident that it can not be safely navigated except under the most favorable conditions of wind and weather. Directly off the mouth of Little Wicomico a part of the shoal called Race Bar extends from the shore above downstream, parallel with and about one-half mile from the mouth, forming a hook on the shoreward side of which about 7 feet can be carried. Race Bar is evidently formed by the littoral movement of sand carried down the Potomac shore by ebb tidal currents and during northwest winds, and also by the action of northeast storms. Passing inside of Race Bar toward the mouth of the river, the water rapidly shoals to about 3 feet at low tide, and it is this bar which obstructs navigation. After crossing the bar a depth of from 8 to 15 feet is found within the river.

A survey of Little Wicomico River was made in 1874, to comply with the provisions of the river and harbor act of June 23, 1874, and the report upon the survey will be found in the Report of the Chief of Engineers for 1875, Appendix W 12. It has only been necessary to supplement the maps of that survey and the information then obtained as to the physical features of the stream by more recent soundings in the channel over the bar. These were taken in October, 1892, and indicate a ruling depth of 3 feet at low tide.

There are many productive farms on the river, and the lands are of good quality and well adapted to trucking. There is also an abundant growth of pine, oak, and chestnut timber, stated to aggregate 80,000,000 feet of lumber. There are 3 sawmills and 2 grain mills contiguous to the river, doing, however, a small business, owing to the lack of transportation facilities. The river abounds in the finest oysters, but for the same reason they yield but little revenue. There are 9 stores near the river. The people of this section are now obliged to haul the products of their farms to landings on Cockles Creek, a branch of the Great Wicomico River, or to barter them with the merchants at low prices. In order to afford them an outlet to market, they request that a channel 9 feet deep be opened through the bar to enable small vessels (and presumably steamers) to enter the river for trade. * * * The location is, however, so exposed to the full force of the northeast storms that I am of the opinion that any timber construction would soon be destroyed, and that a permanent improvement could not be effected without building a substantial breakwater which might have a hearting of oyster shells, but which should be covered with heavy riprap stone. * * *

The value of the trade, both present and prospective, that would be benefited by the improvement can not be stated, as no information could be obtained on which to base an estimate, although such information was solicited, but it is doubtful if such value would warrant the large expenditure * * * necessary to permanently improve the bar at the mouth.

While I am not unmindful of the urgent need of the citizens of this locality of access to a market for the products of their farms by means of suitable routes of water transportation, I am nevertheless constrained to the opinion that the large expenditure necessary for a permanent improvement would not be justified by the limited interests involved. For this reason the river does not appear to be worthy of improvement by the General Government.

Very respectfully, your obedient servant,

Chas. E. L. B. Davis,
Major, Corps of Engineers.

Brig Gen. Thomas L. Casey,
Chief of Engineers, U. S. A.

(Through Col. William P. Craighill, Corps of Engineers, Division Engineer, Southeast Division.)

[First indorsement.]

U. S. Engineer Office,
Baltimore, Md., December 15, 1892.

Respectfully submitted to the Chief of Engineers.

For the reasons stated by the local engineer I concur in the opinion that this locality is not "worthy of improvement by the General Government."

Wm. P. Craighill,
Colonel, Corps of Engineers.

J 15.

PRELIMINARY EXAMINATION OF MORATTICO CREEK, VIRGINIA, OBSTRUCTION AT MOUTH.

[Printed in House Ex. Doc. No. 62, Fifty-second Congress, second session.]

Office of the Chief of Engineers,
United States Army,
Washington, D. C., December 5, 1892.

Sir: I have the honor to submit the accompanying copy of report dated November 30, 1892, by Maj. Charles E. L. B. Davis, Corps of Engineers, upon preliminary examination of obstruction at mouth of Morattico Creek, Virginia, made to comply with requirements of the river and harbor act approved July 13, 1892.

Major Davis reports that in his opinion Morattico Creek is not worthy of improvement by the General Government; and, for the reasons stated by the local engineer, this opinion is concurred in by the division engineer and by this office.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

Hon. S. B. ELKINS,
Secretary of War.

REPORT OF MAJ. CHAS. E. L. B. DAVIS, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Washington, D. C., November 30, 1892.

GENERAL: In compliance with the instructions contained in Department letter of July 14, 1892, I have the honor to submit the following report of a preliminary examination of "Morattico Creek, Virginia, obstruction at mouth," made on October 6, 1892, to comply with the provisions of the river and harbor act approved July 13, 1892.

Morattico Creek is a branch of the Rappahannock River, which it enters on the left at Tarpleys Point, 28 miles above the mouth, and 78 miles below Fredericksburg. Two creeks enter the river at this point, uniting at their mouths to form a shallow bay about a mile wide and three-fourths of a mile long, and lying just below Tarpleys Point. The upper or most northerly of these creeks is now known as Morattico Creek, although it is designated on the Coast Survey map of 1855–'56 as Lower Farnham Creek, which was presumably its name at that time. The lower of the two creeks is now known as Lancaster Creek, but upon the above-mentioned Coast Survey map it is designated as "Morvatico" Creek. Morattico Creek (the northerly creek) is said to be about half a mile long and from 3 to 4 feet deep, while Lancaster Creek is about 2 miles long and about 4 feet deep. My examination was limited to the obstruction at the mouth of Morattico Creek, which consists of the shoal water in the above-mentioned bay. The Rappahannock River at this point is about 3 miles wide, the navigation channel following the center of the stream, with a depth of from 4 to 6 fathoms. Leaving this channel on the proper course for Morattico Creek a wide flat is crossed for 1½ miles, on which the depth gradually decreases from 11 to 6 feet at the entrance to the above-mentioned bay. Thence to the mouth of Morattico Creek the water gradually shoals to a depth of 4 feet at low tide. The soundings taken during the examination agree with those found on the Coast Survey map of 1855–'56, and indicate that no special changes have since occurred.

I have endeavored to obtain some definite statistics of the trade of this creek without success. One of the citizens to whom I was referred stated that the people desired the bars removed, so that steamboats and vessels drawing from 7 to 8 feet could go into the creek. The Weems Steamboat Company (the only line on the Rappahannock) state, however, that their steamers would not enter the creek if it were improved, as they have recently established a new wharf on the river near the mouth of the creek, which they think sufficiently accommodates all shippers in its proximity. That the trade here is not large is evidenced by the fact that the steamers of this line stop at this wharf on only two of the three trips made per week.

The value of the shipments of timber and lumber is stated to be "thousands of dollars," but no definite figures are given. Oyster planting appears to be one of the principal industries at the creek, and the locality is said to be well adapted to oyster culture. At the time of my visit a schooner was lying in the bay discharging oysters, which were taken to the beds in the creek by rowboats. While a channel which would enable oyster and wood vessels to enter the creek and discharge or receive their cargoes would be of service to those engaged in this trade, I have been unable to learn of any commerce of sufficient amount or importance to justify or warrant the improvement of this bar. I would therefore respectfully report that in my opinion Morattico Creek, Virginia, is not worthy of improvement by the General Government.

Very respectfully, your obedient servant,

CHAS. E. L. B. DAVIS,
Major, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. William P. Craighill, Corps of Engineers, Division Engineer, Southeast Division.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., December 1, 1892.

Respectfully submitted to the Chief of Engineers.

For the reasons stated by the local engineer, I concur in the opinion that this locality is not "worthy of improvement by the General Government."

WM. P. CRAIGHILL,
Colonel, Corps of Engineers.

J 16.

PRELIMINARY EXAMINATION OF MILFORD HAVEN, VIRGINIA, BAR AT MOUTH.

[Printed in House Ex. Doc. No. 59, Fifty-second Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 5, 1892.

SIR: I have the honor to submit the accompanying copy of report, dated November 29, 1892, by Maj. Charles E. L. B. Davis, Corps of Engineers, upon preliminary examination of bar at mouth of Milford Haven, Virginia, made in compliance with provisions of the river and harbor act approved July 13, 1892.

Maj. Davis states that, from his examination and from such information as he has been able to obtain, he is of the opinion that the bars at the mouth of Milford Haven are worthy of improvement by the General Government, and recommends that a survey be made, at an estimated cost of $600.

For the reasons stated by the local engineer, Col. William P. Craighill, Corps of Engineers, the division engineer, concurs in this opinion, and in the judgment of this office this locality is worthy of improvement.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

Hon. S. B. ELKINS,
Secretary of War.

REPORT OF MAJ. CHARLES. E. L. B. DAVIS, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Washington, D. C., November 29, 1892.

GENERAL: In compliance with the instructions contained in Department letter of July 14, 1892, I have the honor to submit the following report of a preliminary examination of "Milford Haven, Virginia, bar at the mouth," made on October 5, 1892, to comply with the provisions of the river and harbor act approved July 13, 1892.

Milford Haven, Virginia, is a tidal estuary situated on the westerly shore of the Chesapeake Bay, near Cherry Point, at the mouth of the Piankatank River and about 35 miles north of Fort Monroe, Va. It has two entrances, one at the northwest end of the haven, at Hills Bay, on the Piankatank River, about 2 miles inside of Cherry Point, and another at the southeast end on Chesapeake Bay, about 5 miles south of Cherry Point. It thus forms a strait, separating from the main shore a considerable body of land known as Gwynns Island. Both entrances are obstructed by bars. The northwest entrance from Piankatank River is the one generally used by vessels and steamers entering the haven, and is the mouth referred to in the river and harbor act of July 13, 1892.

Navigation is here obstructed by a bar over which but about 7 feet can be carried at low tide, while the channel is narrow and tortuous and quite difficult to navigate during unfavorable winds. As nearly as can be judged from the soundings on the map of the U. S. Coast Survey of 1869, the length of the bar is from one-fourth to three-eighths of a mile. The bar is exposed to northwest winds, which have a reach across the lower part of the Piankatank River of no less than 4 miles. While it is probable that winds from this quarter are active causes of bar formation at this locality, no definite opinion on this subject could be expressed without the information to be obtained from a detailed survey and observations of the tidal currents. Whatever these forces may be, however, it is evident that they are still in active operation, for a channel was dredged through this bar by the Maryland Steamboat Company (one of whose steamers navigates the haven) in 1882 and again in 1887, and after each dredging the channel gradually shoaled.

After passing the outer bar a sufficient depth of water (indicated on the Coast Survey map as 12 feet or more) is found for a distance of three-eighths of a mile, when an inner bar is met having a depth of but about 6 feet. This bar lies between Cricket Hill Wharf, the first landing made by steamers after entering the haven, and Callis Wharf, on Gwynns Island, which is the second landing. A third landing is made at Fitchetts Wharf (near Matthews Court-House), in Stutts Creek, about 4 miles from the mouth, where the water is also shoal.

Milford Haven is navigated by one steamer, the *Avalon*, belonging to the Maryland Steamboat Company and making two round trips a week from Baltimore. Four landings per week are thus made at each wharf. The steamer draws 7 feet when loaded. There are also eleven schooners and six bugeyes which harbor at Milford Haven, draft not stated.

The following is the estimated value of the annual trade of the haven, as furnished to me by one of the citizens requesting the examination: Oysters, 125,000 bushels; fish valued at $30,000, and farm produce valued at $100,000.

The shipments of merchandise from Baltimore are probably considerable, but their value is not stated. I was informed that the last census showed that between 600 and 700 people are living on Gwynns Island, and these are dependent on water transportation for their supplies.

It is stated that from 150 to 200 vessels pass over the bar annually. Milford Haven is evidently an important harbor of refuge for small vessels.

From my examination of the locality and such information as I have been able to obtain, I am of the opinion that the bars at the mouth of Milford Haven are worthy of improvement by the General Government, and would respectfully recommend that a survey be made with a view of estimating the cost of the work. The cost of such a survey and of the necessary current observations, together with the preparation of maps and project, is estimated at $600.

Very respectfully, your obedient servant,

CHAS. E. L. B. DAVIS,
Major, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. William P. Craighill, Corps of Engineers, Division Engineer, Southeast Division.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., December 1, 1892.

Respectfully submitted to the Chief of Engineers.

For the reasons stated by the local engineer, I concur with him in the opinion that this locality is "worthy of improvement by the General Government."

WM. P. CRAIGHILL,
Colonel, Corps of Engineers.

APPENDIX K.

IMPROVEMENT OF RIVERS AND HARBORS IN SOUTHEASTERN VIRGINIA AND NORTHEASTERN NORTH CAROLINA.

REPORT OF LIEUT. EDWARD BURR, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1893, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. **Harbor of Norfolk and its approaches, Virginia.**
2. **Approach to Norfolk Harbor and the United States navy-yard at Norfolk, Va.**
3. **Nansemond River, Virginia.**
4. **Chickahominy River, Virginia.**
5. **Appomattox River, Virginia.**
6. **Inland water route from Norfolk, Va., to Albemarle Sound, North Carolina, through Currituck Sound.**
7. **North Landing River, Virginia and North Carolina.**
8. **Removing sunken vessels or craft obstructing or endangering navigation.**

EXAMINATION.

9. **Harbor at Petersburg and Appomattox River, Virginia.**

United States Engineer Office,
Norfolk, Va., July 7, 1893.

General: I have the honor to transmit herewith the annual reports for the fiscal year ending June 30, 1893, upon the works of river and harbor improvement in my charge.

Very respectfully, your obedient servant,

Edw. Burr,
First Lieut., Corps of Engineers.

Brig. Gen. Thomas L. Casey,
Chief of Engineers, U. S. A.

K 1.

IMPROVEMENT OF HARBOR OF NORFOLK AND ITS APPROACHES, VIRGINIA.

In 1877, previous to commencing the present improvement, the harbor of Norfolk was obstructed by shoals at the mouths of the Eastern and Southern branches, the shoal in the Eastern Branch being about one-third of a mile long, with a depth at low water of 15 to 16 fe the shoal in the Southern Branch being short and with a depth water of 22 to 23 feet. The approaches to the harbor were obs by shoals at Sewall Point, 3 miles long, with a depth at low wat feet, and at the mouth of the Western Branch, 1 mile long, with at low water of 19 feet. The depths on these shoals and the wi the channels, particularly in the inner harbor where encroache by Portsmouth and Berkley flats, were insufficient for the requir of the port.

The plan of improvement adopted in 1878 was to deepen and the channels at the mouth of the Southern Branch and along mouth and Berkley flats in the harbor proper, and to improve t proaches to the harbor by dredging a channel 500 feet wide and deep at ordinary low water through the shoals at Sewall Point a the mouth of the Western Branch.

The revised project of 1885 is as follows: (1) To dredge a ch not less than 500 feet wide and 25 feet deep at ordinary low wate the deep water in Hampton Roads to Norfolk and the United S navy-yard on the Southern Branch, and also to dredge a channel Eastern Branch not less than 22 feet deep at ordinary low water, a width of 700 feet at its mouth and of not less than 300 feet a Norfolk and Western Railroad Bridge; (2) to ultimately dredg entire area bounded by lines parallel to and 75 feet from the warden lines to a depth not less than 25 feet from Fort Norfolk to United States navy-yard, and not less than 22 feet from the mou the Eastern Branch to Campostella Bridge, and to build a bulk at Berkley Flats.

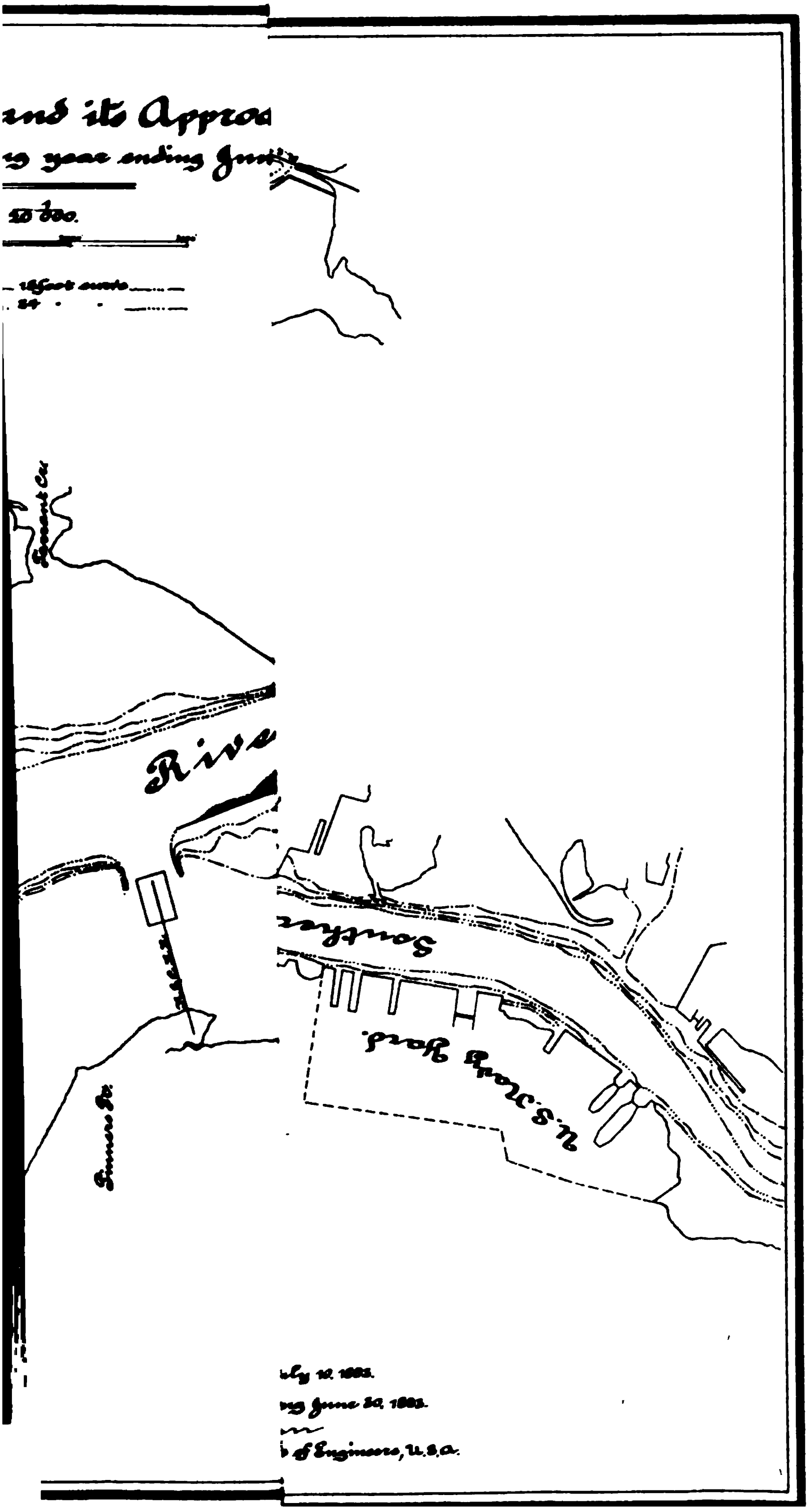
To the project of 1885 there was added in 1890, under the autho of the river and harbor act of September 19, 1890, the dredging of anchorage at the mouth of the Western Branch, with a depth of less than 25 feet at ordinary low water, at an estimated cost of $150,0 which amount was added to the original estimates.

With slight modifications all operations have been conducted in cordance with the adopted projects.

The amount expended on this improvement to June 30, 1892, $629,242.99, from which resulted a channel not less than 500 feet wi and 25 feet deep at ordinary low water from Hampton Roads to N folk Harbor, a channel of the same depth and from 125 feet to 500 f wide in the Southern Branch to the United States navy-yard, and channel not less than 22 feet deep at ordinary low water, and from 3 feet to 500 feet wide in the Eastern Branch to the Norfolk and Wes ern Railroad Bridge.

The channels thus dredged were in good condition with the exce tion of the bar at the mouth of the Southern Branch, which, by 188 had shoaled to 22 feet, and had not been redredged.

One hundred and fifty thousand dollars were appropriated for th improvement by act of July 13, 1892. The approved project for th expenditure of this appropriation included the dredging of the shoal and flats in the inner harbor and the continuation of the dredging c the anchorage at the mouth of the Western Branch. Proposals wer advertised for, and on October 6, 1892, a contract was entered into wit the Morris and Cummings Dredging Company, of New York, to do th required dredging, about 1,000,000 cubic yards, at $13\frac{4}{9}$ cents per cubi yard, scow measurement, the contract to be completed by December 31 1893. The material is mud, with some sand, clay, and oyster shells



and its Approa
g year ending Jun
20 000.
18 feet curve
24
Goose Cr.
River
Southea
U.S. Navy Yard.
Pinners Pt.
uly 10, 1883.
ng June 30, 1883.
of Engineers, U.S.A.

and is redeposited on Willoughby Bank, in Hampton Roads, to the eastward of the Ripraps, the tow varying from 11 to 15 miles.

Dredging under this contract was commenced in November, 1892, with one dredge, and in December a second dredge was added. The first machine continued work to the end of the year, and the second was removed from the work early in June, 1883. The amount dredged and redeposited was 917,170 cubic yards. Of this amount 142,282 cubic yards were removed from Berkley Flats at and above the mouth of the Eastern Branch; 93,088 cubic yards were removed from Portsmouth Flats and the bar at the mouth of the Southern Branch; 170,572 cubic yards were removed from the flat opposite Atlantic City; and 383,019 cubic yards were removed from the anchorage.

A portion of Berkley Flats, 4,000 feet long and of a maximum width of 400 feet, was dredged to a depth of not less than 22 feet at ordinary low water, increasing the width of the channel in the Eastern Branch to 1,000 feet at its mouth and to 500 feet nearly to the Norfolk and Western Railroad Bridge. The bar at the mouth of the Southern Branch and a portion of Portsmouth Flats were dredged to a depth of not less than 25 feet at ordinary low water, giving a channel from 400 feet to 650 feet wide in the SouthernBranch to the United States navy-yard. A portion of the flat opposite Atlantic City, 3,400 feet long and of a maximum width of 450 feet, was dredged to a depth of not less than 25 feet at ordinary low water, increasing the width of the channel at this point to 700 feet. The dredging at the mouth of the Western Branch produced 24 acres of the proposed anchorage with a depth not less than 25 feet, excepting over a number of old wrecks that were uncovered by the dredging and have not yet been removed. As a result of the operations of the past two years, 56 acres of the proposed anchorage have been dredged and 17 acres in addition that required no dredging have been made available.

The steam tender belonging to this district was thoroughly overhauled at Baltimore, under contract with John Cahill, dated September 29, 1892, at a cost of $6,775 for contract work and extras.

During the fiscal year ending June 30, 1893, there was expended on this improvement $114,331.87, applied to payments on contracts, repairs to plant, office and operating expenses, etc.

APPROPRIATIONS.

August 14, 1876	$35,000	August 5, 1886	$50,000
June 18, 1878	50,000	August 11, 1888	50,000
March 3, 1879	75,000	September 19, 1890	150,000
June 14, 1880	50,000	July 13, 1892	150,000
March 3, 1881	75,000		
August 2, 1882	75,000	Total	785,000
July 5, 1884	25,000		

Money statement.

July 1, 1892, balance unexpended		$5,788.30
Amount appropriated by act approved July 13, 1892		150,000.00
		155,788.30
June 30, 1893, amount expended during fiscal year		114,331.87
July 1, 1893, balance unexpended		41,456.43
July 1, 1893, outstanding liabilities	$23,925.37	
July 1, 1893, amount covered by uncompleted contracts	11,691.70	
		35,617.07
July 1, 1893, balance available		5,839.36

Amount (estimated) required for completion of existing project	$307,744.56
Amount that can be profitably expended in fiscal year ending June 30, 1895	200,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for dredging harbor at Norfolk and its approaches, Virginia, opened September 19, 1893, by Lieut. Edward Burr, Corps of Engineers.

No.	Name and address of bidder.	Time.		Number and kind of machines.	Price per cubic yard.
		Commence.	Complete.		
					Cents.
1	P. Sanford Ross, Jersey City, N. J.	Nov. 1, 1892	May 31, 1894	1 clam-shell dredge	14¼
*2	Morris and Cumings Dredging Co., New York.	....do	Dec. 31, 1893	2 or more clam-shell dredges.	13¾
3	C. P. E. Burgwyn, Richmond, Va.	On notification.	May 31, 1894	......do	15.5
4	American Dredging Co., Philadelphia, Pa.	Nov. 1, 1892	....do	2 or more grapple dredges	13.9

* Accepted.

Total of each bid, $135,000.

Abstract of proposals for repairs to United States Steam Tender Lucerne, opened September 22, 1892, by Lieut. Edward Burr, Corps of Engineers.

No.	Name and address of bidder.	Where work will be done.	Time of completion of work.	Price.
*1	John Cahill, trading as James Clark & Co., Baltimore, Md.	Baltimore, Md	8 months	$5,450
2	Louis H. Skinner, New Berne, N. C	New Berne, N. C	90 days	8,460
3	E. J. Codd & Co., Baltimore, Md	Baltimore, Md	125 working days	5,375
4	C. Reeder & Son, Baltimore, Md	....do	120 working days	5,879

* Accepted.

COMMERCIAL STATISTICS.

CUSTOM-HOUSE, NORFOLK, VA.,
Collector's Office, May 13, 1893.

SIR: Inclosed please find a statement of imports, exports, number of vessels entered from and cleared for foreign ports, with their tonnage, at this port from January 1 to December 31, 1892.

Very respectfully,

R. G. BANKS,
Collector.

Lieut. EDWARD BURR, U. S. A.

Imports.

Articles.	Quantity.	Value
Kainit		$16,4[illegible]
Salt		3,4[illegible]
Dead oil of tar		3,[illegible]
Wine		[illegible]
Coal		[illegible]
Miscellaneous		13,[illegible]
Total		37,[illegible]

Exports.

Articles.	Quantity.	Value.
Cotton ... bales	125, 186	$4, 885, 554
Coal ... tons	148, 451	555, 742
Staves		305, 085
Lumber, logs, etc		391, 931
Rye ... bushels	149, 919	110, 075
Bark		12, 749
Cattle ... head	1, 380	102, 280
Tobacco ... pounds	4, 645, 279	327, 585
Corn ... bushels	598, 552	318, 860
Wheat ... do	135, 146	624, 281
Flour ... barrels	74, 418	443, 195
Rosin		9, 051
Oats		59, 200
Cotton-seed oil ... gallons	1, 397, 643	177, 400
Cotton-seed meal ... bushels	9, 434, 840	83, 926
Miscellaneous		5, 492
Total		8, 382, 412

Navigation.

Direction.	Vessels cleared.		Vessels entered.	
	No.	*Tons.*	*No.*	*Tons.*
Foreign	528	696, 217	56	65, 295
Coastwise	1, 391	1, 373, 048	1, 594	1, 419, 176
Total	1, 919	2, 069, 265	1, 650	1, 484, 471

LETTER OF MR. NORMAN BELL, SUPERINTENDENT AND SECRETARY, NORFOLK AND PORTSMOUTH COTTON EXCHANGE.

NORFOLK, VA., *June 5, 1893.*

DEAR SIR: Herewith please find statement of the receipts and shipments of cotton at the port of Norfolk, Va., for twelve months ending December 31, 1892.

	Bales.
Total receipts cotton at Norfolk, twelve months ending December 31, 1892	355, 539
Stock on hand December 31, 1891	65, 709
Exported:	
Great Britain, France, and continent	129, 947
Coastwise shipments, overland and inland	242, 823
Total shipments	372, 770
Stock on hand December 31, 1892	48, 478
Total	421, 248

On the basis of 487¼ pounds to the bale, which is the average weight of bales exported from this port December 31, 1892, the total shipment of cotton amounted to 81,105 tons.

The falling off in the movement of cotton at Norfolk is attributed to the reduced yield in the territory tributary to this port, consequent upon the unfavorable crop season of 1892.

I remain, dear sir, yours very truly,

NORMAN BELL,
Superintendent and Secretary.

Lieut. EDWARD BURR, U. S. A.

Exports of coal from Lambert Point Piers at Norfolk, Va., as cleared by William Lamb & Co., agents, from January 1, 1892, to December 31, 1892.

	Tons.
Foreign	155,280
Coastwise	1,499,017
Total	1,654,296

Vessels engaged in the movement of this coal for the year 1892.

Steamships	484
Tugs and ocean barges	751
Schooners	590
Total	1,82

Tabular statement of value of exports and imports and of number and tonnage of vessels entered at and cleared from the port of Norfolk, Va.

Year ending Jan. 1—	Foreign vessels.				Coastwise vessels.				Exports.	Imports
	Entered.		Cleared.		Entered.		Cleared.			
	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.		
1883	64	29,572	135	112,529	1,314	1,248,461	818	1,099,266	$18,201,759	$167,15
1884	96	69,421	156	110,450	1,257	1,003,920	880	996,062	12,351,672	223,67
1885	66	70,711	127	102,821	1,330	1,078,484	1,450	1,275,477	14,797,046	12[illegible]
1886	82	67,168	159	141,913	1,398	1,215,398	1,555	1,334,557	11,646,907	127,[illegible]
1887	73	73,896	208	207,428	1,432	1,261,365	1,719	1,432,016	14,393,337	99,9
1888	66	59,805	212	234,644	1,314	1,360,633	1,474	1,354,620	12,381,122	99,5
1889	51	61,975	227	256,351	1,328	1,286,573	1,402	1,290,013	13,865,586	176,2
1890	70	80,887	288	335,021	996	1,265,470	1,302	1,230,189	12,828,641	166,9
1891	81	83,341	397	463,216	1,169	1,140,625	1,504	1,546,235	15,096,634	94,4
1892	94	116,926	499	672,197	1,582	2,042,257	1,827	1,958,718	15,269,094	58,29
1893	56	65,295	528	696,217	1,594	1,419,176	1,391	1,373,048	8,382,412	37,98

Approximate amount of freight of all kinds received and shipped by water.

	Tons.
1888	1,914,50
1889	2,243,08
1890	2,381,84
1891	2,931,75
1892	3,427,18

K 2.

IMPROVEMENT OF APPROACH TO NORFOLK HARBOR AND THE UNITE STATES NAVY-YARD AT NORFOLK, BETWEEN LAMBERT POINT AN FORT NORFOLK, VIRGINIA.

In its original condition this portion of the approach to Norfolk Ha bor and the United States (Norfolk) navy-yard was obstructed by shoal at the mouth of the western branch about 1 mile long, with depth of 19 feet at ordinary low water.

The project of 1878 was to dredge through this shoal a channel 50 feet wide with a depth of not less than 25 feet at ordinary low wate

The revised project of 1886 is (1) to secure a channel not less tha 500 feet wide and 25 feet deep at ordinary low water from Lamber Point to Fort Norfolk by the construction of a dike and by dredgin and (2) to ultimately widen this channel to within 75 feet of a straigh line drawn from Fort Norfolk to the deep water off Lambert Poin 6,800 feet of which is the proposed warden line, making a channel a least 700 feet wide.

The amount expended on this improvement between July 5, 1884, and June 30, 1892, was $197,500, from which resulted a channel between Lambert Point and Fort Norfolk 700 feet wide and 25 feet deep at ordinary low water, and a channel of the same depth and 600 feet wide from deep water off Lambert Point to the port warden line.

The desired channel was secured in July, 1889, and the project of 1886 completed, with the exception of the dike. Since that date no dredging has been done. The survey of 1889 and examinations made in April, 1890, and May, 1891, did not show any shoaling of the dredged channel. A survey made in May, 1892, showed a shoaling on the eastern side of the channel, thought not to be due to natural causes. This can only be determined by later surveys, but it is not probable that the dike will be necessary for the maintenance of the channel. The amount estimated for the construction of this dike could be more advantageously expended in removing the shoal in front of and below the piers at Lambert Point, on the east side of the channel.

There were no expenditures for this improvement during the fiscal year ending June 30, 1893, and no further appropriations will be required for this project at present.

For commercial statistics see report on the improvement of the harbor of Norfolk and its approaches, Virginia.

APPROPRIATIONS.

July 5, 1884	$50,000
August 5, 1886	137,500
August 11, 1888	10,000
Total	197,500

Money statement.

Amount (estimated) required for completion of existing project Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867.	$108,000

K 3.

IMPROVEMENT OF NANSEMOND RIVER, VIRGINIA.

This river is one of the important tributaries of Hampton Roads, Virginia, and is navigable at high water for vessels drawing 11 feet as far as the city of Suffolk, 16 miles from its mouth.

Five railroads, two of which terminate at this place, put this city in communication with the South and West, and two lines of steamers run between it and Norfolk and Baltimore.

In 1872, before any improvement was undertaken, the navigable channel of the Nansemond River was 5 feet deep at low water and was much obstructed by wrecks, snags, etc.

Between 1873 and 1878 the Government dredged a channel, wherever necessary, 8 feet deep at low water from Suffolk to Hampton Roads, at a cost of $37,000. This depth not proving sufficient to meet the demands of its growing commerce, in obedience to the requirements of the river and harbor act of August 5, 1886, an examination and survey of the river were made to determine what other improvement was necessary.

The plan of improvement then proposed and since adopted is to secure a channel not less than 100 feet wide at bottom, 12 feet deep at mean low water, from the head of navigation to the mouth of the western branch, 5.37 miles, including a turning basin 200 feet square, 300 feet below Suffolk Bridge, by dredging and by the construction of spurs and training walls, and a channel of like depth from the mouth of the western branch to deep water at Town Point, 200 feet wide at bottom at its upper end and gradually increasing to at least 400 feet at its lower end, etc., the total estimated cost being, in round numbers, $152,000.

The amount expended on the present project to June 30, 1892, was $8,625.83, applied to dredging a channel 40 feet wide and 11 feet deep at ordinary low water through Suffolk Shoal and to repairs to dikes.

Ten thousand dollars was appropriated for this improvement by act of September 19, 1890, and a contract was made with the Alabama Dredging and Jetty Company, of Mobile, Ala., to do the required dredging, the work to be completed by June 30, 1892. The contractors failed to commence the work before the time set for the completion of contract. Upon their application an extension of sixty days to the contract time was granted, and on a second application a further extension of sixty days was also granted. Dredging was commenced in July, 1892, and the contract completed in October, 1892. Forty-two thousand and twelve cubic yards of material were removed and redeposited on the flats in Hampton Roads to the westward of the mouth of the river. A channel 80 feet wide and not less than 12 feet deep at mean low water was dredged through three shoals from 2 miles to 3½ miles below Suffolk Bridge.

Ten thousand dollars was appropriated for this improvement by act of July 13, 1892, and a contract was made with the Rittenhouse Moore Dredging Company, of Mobile, Ala., to do the required dredging, the work to be completed by April 30, 1894. Under this contract dredging was commenced in March, 1893, and the work completed in May, 1893. Thirty-seven thousand four hundred and fifty-eight cubic yards of material were removed and re-deposited as in the previous contract. A channel 80 feet wide and not less than 12 feet deep at mean low-water was dredged through two shoals from one-half mile to 2 miles below Suffolk Bridge and the channel through Suffolk Shoal was increased in width by a cut 1,375 feet long and of the same depth. As a result of the year's operations, a channel 80 feet wide and not less than 12 feet deep at mean low water has been secured through the worst of the shoals between Suffolk and the mouth of the Western Branch.

There was expended on this improvement during the fiscal year ending June 30, 1893, $21,342.89, applied to payments on contracts, office and operating expenses, etc.

APPROPRIATIONS.

March 3, 1873	$15,000	August 11, 1888	$10,000
March 23, 1874	10,000	September 19, 1890	10,000
March 3, 1875	5,000	July 13, 1892	10,000
August 14, 1876	5,000		
June 18, 1878	2,000	Total	67,000

Money statement.

July 1, 1892, balance unexpended	$11,374.17
Amount appropriated by act approved July 13, 1892	10,000.00
	21,374.17
June 30, 1893, amount expended during fiscal year	21,342.89
July 1, 1893, balance unexpended	31.30
Amount (estimated) required for completion of existing project	122,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	50,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for dredging Nansemond River, Virginia, opened January 26, 1893, by Lieut. Edward Burr, Corps of Engineers.

No.	Name and address.	Time.		Number and kind of machines.	Daily amount guaranteed.	Price per cubic yard.
		Commence.	Complete.			
					Cu. yds.	*Cents.*
*1	Atlas Dredging Co., Wilmington, Del.	Nov. 1, 1893.	Apr. 30, 1894.	1 grapple dredge....	....	25
2	H. E. Culpepper, Portsmouth, Va.	10 days after signing contract.	Jan. 1, 1894..	1 scoop dredge......	500	28
					1,000	25
†3	Rittenhouse Moore Dredging Co., Mobile, Ala.	Approval of.	90 days	1 clam-shell dredge.		
4	C. P. E. Burgwyn, Richmond, Va.	60 days after notification.	Apr. 30, 1894.	1 dipper dredge.....	300	28½
5	C. T. Caler, Norfolk, Va.	Dec. 31, 1893.	....do	....do	500	27½

* Conditioned upon also receiving contracts for dredging in Chickahominy River, Virginia, and Inland Water Route from Norfolk Harbor, Virginia, to Albemarle Sound, North Carolina.

† Accepted.

Total of each bid, $9,500.

COMMERCIAL STATISTICS.

The shipments on this river are principally farm products, lumber, etc. Full statistics could not be gotten for the year 1891, although an effort was made to do so. If full shipments of the lumber had been furnished the tonnage would have shown an increase instead of a decrease for 1891.

Approximate amount of freight of all kinds received and shipped by water.

	Tons.
1888	109,900
1889	217,738
1890	117,836
1891	133,723

K 4.

IMPROVEMENT OF CHICKAHOMINY RIVER, VIRGINIA.

This river is one of the principal tributaries of the James River, and is navigable at high water for vessels drawing 12 feet to Binn Bar, 2½ miles below Windsor Shades. The latter place is the head of navigation, and is 25 miles from the mouth of the river.

Previous to any improvement the channel from Binn Bar to Windsor Shades was obstructed by several shoals with a depth of 4 to 5 feet at low water, and the entrance to the river was obstructed by a bar.

The present project of improvement is to dredge a channel from 100 to 150 feet wide and not less than 8 feet deep at low water through the shoals near the head of navigation, and a channel 200 feet wide and 14 to 15 feet deep at low water through the bar at the entrance. The rise of the tide is about 3 feet.

The amount expended on the present project to June 30, 1892, was $23,813.69. The channel through the bar at the entrance to the river has been dredged to the projected dimensions. An examination made in January, 1891, of the work hitherto done showed that very little shoaling had taken place in the channels dredged since 1878, the worst shoals being those near Old Fort. These shoals and those between Binn Bar and Windsor Shades have since been dredged to a depth not less than 8 feet at low water and to a width of 60 feet, excepting a part of Windsor Shades Bar, where the width is only 40 feet.

Five thousand dollars was appropriated for this improvement by act of July 13, 1892. A contract was entered into with Chester T. Caler, of Norfolk, Va., on March 18, 1893, to do the required dredging at 23 cents per cubic yard for material deposited on shore and 13 cents per cubic yard for material deposited by dumping. Work under this contract is to be commenced before March 1, 1894, and completed by April 30, 1894.

There was expended on this improvement during the fiscal year ending June 30, 1893, $15.02, applied to office expenses.

APPROPRIATIONS.

June 13, 1878	$5,000	August 11, 1888	$2,500
March 3, 1879	1,000	September 19, 1890	2,500
June 14, 1880	2,000	July 13, 1892	5,000
March 3, 1881	2,000		
August 2, 1882	5,000	Total	29,000
August 5, 1886	4,000		

Money statement.

July 1, 1892, balance unexpended	$187.31
Amount appropriated by act approved July 13, 1892	5,000.00
	5,187.31
June 30, 1893, amount expended during fiscal year	15.02
July 1, 1893, balance unexpended	5,172.29
July 1, 1893, amount covered by uncompleted contracts	4,700.00
July 1, 1893, balance available	472.29

Abstract of proposals for dredging Chickahominy River, Virginia, opened January 26, 1893, by Lieut. Edward Burr, Corps of Engineers.

No.	Name and address.	Time.		Number and kind of machines.	Daily amount guaranteed.	Price per cubic yard.
		Commence.	Complete.			
					Cu. yds.	Cents.
*1	Atlas Dredging Co., Wilmington, Del.	Nov. 1, 1893.	Apr. 30, 1894.	1 grapple dredge	....	35
2	H. E. Culpepper, Portsmouth, Va.	On signing contract.	Jan. 1, 1894.	1 scoop dredge	300	32
†3	Rittenhouse Moore Dredging Co., Mobile, Ala.	90 days after approval of contract.	60 days	1 clam-shell dredge	500	33
4	C. P. E. Burgwyn, Richmond, Va.	60 days after notification.	Apr. 30, 1894.	1 dipper dredge	300	24½
†5	Chester T. Caler, Norfolk, Va.	Mar. 1, 1894.	do	do	600	‡13 §23

* Measured in bucket if placed direct or in scows if removed in them. Conditioned upon also receiving contracts for dredging in Nansemond River, Virginia, and Inland Water Route from Norfolk Harbor, Virginia, to Albemarle Sound, North Carolina.

† Accepted.

‡ For material dumped.

§ For material put ashore.

Total of each bid, $4,700.

COMMERCIAL STATISTICS.

The shipments on this river are principally farm products, sawed lumber, cord wood, railroad ties, etc. The receipts are agricultural implements, fertilizers, and general merchandise. It has not been possible to obtain a statement of the amounts of the various articles received and shipped, but their values are given as follows (approximately):

Shipments, wood, ties, lumber, etc	$1,000,000
Receipts	150,000

K 5.

IMPROVEMENT OF APPOMATTOX RIVER, VIRGINIA.

This river is one of the principal tributaries of the James River, into which it empties at City Point, Va. It is navigable as far as the city of Petersburg, Va., about 11 miles from its mouth, and before improvement had a tortuous channel obstructed by shoals, over which there was about 6½ feet of water at high tide.

The project for this improvement was adopted in 1870, and provided for a channel 60 feet wide at bottom and 12 feet deep at ordinary high water. As subsequently modified, the project is to provide a channel from Petersburg to natural deep water at Point of Rocks 80 feet wide at bottom and 12 feet deep at ordinary high water by dredging, by constructing regulating and contracting works, and by making a cut-off called Puddledock Cut. With slight modifications of details, all operations have been conducted in accordance with this project.

This stream is subject irregularly to freshets, by which large quantities of sand are brought down and deposited in the navigable portion of the river. The currents of ordinary stages of the river have not sufficient power to remove the shoals thus formed, and a sum of $10,000 per annum is estimated as required for their removal by dredging and for repairing damages to contracting and regulating works by freshets and deterioration. The sums appropriated for this improvement have, for many years, been but little in excess of the amount required for the repairs to the channel and the works already constructed. The completion of the permanent improvement of the river has consequently dragged beyond all reason, and the apparent cost of the improvement has been much in excess of the original estimates, while the actual amount expended in accordance with these estimates has been but a small proportion of the total expenditures.

The amount expended by the United States on this improvement to June 30, 1892, was $404,587.63.

By 1875 a channel 60 feet wide and 12 feet deep at ordinary high water had been secured from Petersburg to Point of Rocks by dredging such shoals as required it and by making a cut-off called Puddledock Cut. This channel was subsequently increased in width to 80 feet, and has been maintained with a depth of 11 to 12 feet as constantly as possible by redredging shoals formed by freshets and by constructing contracting and regulating works.

The redredging of shoals formed by winter and spring freshets was begun at the end of June, 1892. At Sunken Island one cut 25 feet wide and 350 feet long was dredged and 900 cubic yards of material removed. Below the mouth of the South Channel two cuts were dredged for a channel width of 40 feet and a length of 880 feet and

5,100 cubic yards of material removed. Above Gatling's Landing, in the South Channel, two cuts were dredged 20 feet wide, one cut having a length of 800 feet and the other a length of 400 feet, and 5,800 cubic yards of material were removed. At the head of Puddledock Cut and the lower end of the Closure Dike two cuts were dredged for a channel width of 40 feet and a length of 1,000 feet, and 5,400 cubic yards of material were removed. At Magazine Bend two cuts were dredged for a length of 1,450 feet and a third cut for 600 feet of this distance, giving a channel 60 and 40 feet wide. Fourteen thousand one hundred and twenty-five cubic yards of material were removed. Of the dredged material 19,525 cubic yards were disposed of in constructing a portion of the dam at the Closure Dike, and the remaining 11,800 cubic yards were deposited on the banks. The total amount dredged was 31,325 cubic yards; the total expense for dredging was $5,672.20, and the average cost per cubic yard was 18.1 cents.

The brush dikes in Magazine Bend were refilled with brush where required. One thousand four hundred and seventy-five linear feet of dike were refilled with 275 cords of brush, at a total cost of $299.77—an average of 23.2 cents per foot of dike and $1.09 per cord of brush.

A new wale piece was placed on the Closure Dike for a length of 1,640 feet where the top of the sheet piling had become rotten. Total cost, $157.50, or 9.6 cents per foot.

A dam was constructed at the Closure Dike with the object of forcing a greater portion of the freshet flow through Puddledock Cut, to assist in maintaining the depth in the cut, and to eradicate, if possible, one of the causes of the shoal that forms in this locality during freshets. The upper part of this dam was built of the material dredged from shoals, and was carried above extreme freshet high water. The lower part was built of timber crib work filled with gravel and stone, and was carried to about 4 feet above ordinary high water—ordinary freshet height. The ends of the gravel dam were protected by timber abutments. Nineteen thousand five hundred and twenty-five cubic yards of dredged material were used in the gravel dam. The timber dam has a length, including abutments, of 1,243 feet, and cost $6,311.24, or $5.08 per linear foot. This includes the cost of rebuilding 350 feet of the dam, which was damaged by a freshet while in an unfinished state. It also includes the cost of the brush foundation for the dam and brush protection along the entire face.

The freshets of the past winter and spring caused little damage to the works on the river, but partially reformed the shoals dredged during the year, reducing the available depth, as shown by an examination made in the latter part of June, 1893, to about 10 feet at ordinary high water.

The expenditures for this improvement during the fiscal year ending June 30, 1893, were $11,961.50.

Reference is made to special reports of April 21* and June 8, 1893, copies of which are transmitted herewith, for information more in detail concerning the projects for this improvement, the progress made on these projects, and the condition of the river.

During the year a revision was made of the estimates of cost for completing the permanent improvement of the river, details of which will be found in the report of June 8, 1893. In the estimates for the fiscal year ending June 30, 1895, there is included an item of $10,000 for maintenance and repairs in accordance with the estimates of the Board of Engineers of 1870.

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* Not printed.

APPROPRIATIONS.

March 3, 1871	$50,000	March 3, 1881	$20,000
June 10, 1872	40,000	August 2, 1882	35,000
March 3, 1873	30,000	July 5, 1884	25,000
June 23, 1874	30,000	August 5, 1886	18,750
March 3, 1875	30,000	August 11, 1888	15,000
August 14, 1876	30,000	September 19, 1890	15,000
June 18, 1878	30,000	July 13, 1892	15,080
March 3, 1879	20,000		
June 14, 1880	20,000	Total	423,830

Money statement.

July 1, 1892, balance unexpended	$4,162.37
Amount appropriated by act approved July 13, 1892	15,080.00
	19,242.37
June 30, 1893, amount expended during fiscal year	11,961.50
July 1, 1893, balance unexpended	7,280.87
July 1, 1893, outstanding liabilities	751.92
July 1, 1893, balance available	6,528.95
Amount (estimated) required for completion of existing project	48,090.00
For maintenance and repairs during fiscal year ending June 30, 1895	10,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	58,090.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

COMMERCIAL STATISTICS.

[Furnished by Mr. W. E. Morrision, port warden.]

Statement of number and tonnage of vessels and value of freight shipped and received at Petersburg, Va.

Year ending—	No.	Tonnage.	Value of freights.		
			Shipped.	Received.	Total.
July 1—					
1881	645	35,967	$74,724	$412,642	$487,366
1882	917	43,961	79,154	519,209	598,363
1883	980	46,070	181,763	569,876	751,639
1884	924	46,050	196,458	612,472	808,930
1885	893	40,669	230,508	529,786	760,294
1886	953	68,835	192,053	474,250	666,303
1887	836	63,169	104,923	304,425	409,348
1888	599	30,079	143,673	372,112	515,785
1889	595	27,981	132,072	270,031	402,103
January 1—					
1890	598	29,229	184,596	323,256	507,852
1891	621	35,219	425,887	280,254	706,141
1892	627	40,034	313,317	330,786	644,103
July 1, 1893	639	42,058	218,270	227,452	445,722

Approximate amount of freight of all kinds received and shipped by water.

	Tons.
1888	30,626
1889	26,121
1890	21,693
1891	26,275
1892	25,218

REVISION OF ESTIMATE OF COST OF IMPROVEMENT OF APPOMATTOX RIVER, VIRGINIA.

UNITED STATES ENGINEER OFFICE,
Norfolk, Va., June 8, 1893.

GENERAL: I have the honor to submit herewith for approval a revision of the estimate of cost for continuing the improvement of the Appomattox River, Virginia. In this connection I have to respectfully invite your attention to my report of April 21, 1893, upon the condition of this improvement. In this report will be found a concise statement of the history of the work, together with the project as modified from its original form. There will also be found a statement of the amounts of the different classes of work done, the expenditures therefor, and the results accomplished thereby.

The improvement of the Appomattox River was assumed by the United States in 1871 by the appropriation of $50,000 for commencing the work. The project for the improvement was prepared by a board of engineers in 1870, under authority of an examination and survey called for by act of July 7, 1870. The plan favored by the board was to give as soon as possible a channel 60 feet wide at the bottom and 12 feet deep at ordinary high water, avoiding where possible abrupt bends and long straight reaches, regulating them where they could not be avoided, and never abandoning the existing channel without strong reasons. A large amount of work had, however, been done by the city of Petersburg for the improvement of the river and the board deemed it advisable to recommend a plan that would utilize so much of this work as had been done in making a cut-off through Puddledock Marsh. The project of the board did not include the completion of this cut to the Old South Channel and the reopening of that channel according to the plan being followed by the city. Before active operations could be commenced by the United States the city had carried the cut through Puddledock Marsh much beyond the point approved by the board, and in order to utilize the large expenditure of the city on this work the project was changed so as to include the completion of Puddledock Cut and the consequent reopening of the Old South Channel. Subsequently the width of the proposed channel was increased to 80 feet, a width of 60 feet having been found to be insufficient. The project as thus modified is to secure a channel 80 feet wide at the bottom and 12 feet deep at ordinary high water from Petersburg to natural deep water at Point of Rocks, by dredging, by constructing regulating and contracting works where needed, by making a cut-off called Puddledock Cut, and by reopening the Old South Channel.

With some slight modifications of details this project has been followed. The channel of the projected width and depth was opened from Petersburg to Point of Rocks by dredging where necessary. This channel has been maintained more or less constantly by redredging shoals formed by freshets and by constructing regulating and contracting works where required by excessive curvature or width of the natural channel.

The estimate of the Board of Engineers of 1870 included an item of $10,000 annually for repairs to the channel and the banks. The estimates for this improvement have been several times exhausted and revised. This condition of affairs has resulted from the omission in the annual estimates of this estimate of $10,000 for repairs. The expenditures for this purpose have been about $200,000 for the twenty-two years ending June 30, 1893, an average of nearly $10,000 per annum.

The estimate of the board for the permanent completion of the work was $367,600. If to this sum had been added $10,000 annually for repairs the total of the estimate to June 30, 1893, would have been $587,600. The sums appropriated for this improvement amount to $423,830, leaving, according to the original estimate, a balance unappropriated of $163,770. A better result can be obtained by a revision of the estimates upon the basis of the work remaining to be done to complete the project, particularly as the project upon which the original estimate was based has been modified in some material details.

A review of the work already accomplished and of the condition of the river as a result thereof is a necessary preliminary to a discussion of future operations. Of the expenditures to the present time much the larger part has been applied to the original dredging of the channel, to the redredging of shoals formed by freshets, and to repairs and renewals of works, plant, etc. The remainder has been applied to works of permanent improvement which now cover more or less continuously 6 miles of the 7⅝ miles of the river included in the present project. The general character of these works and their relation to the navigable channel is shown on the accompanying map. Their effect has been in all cases beneficial, and a channel depth of from 11 feet to 12 feet at ordinary high water is now maintained with little difficulty except at two points, in Magazine Bend and at the head of Puddledock Cut. While a depth of from 11 feet to 12 feet is maintained at other points, it is not in all cases of sufficient width or so located that the greatest benefit is obtained from it. A fuller description of the channel and a project for continuing its improvement is given below, beginning at Petersburg Harbor and passing downstream.

The United States has not undertaken the improvement of Petersburg Harbor, but has, with one exception, confined its operations to the channel leading thereto. No estimate is therefore made at this present time for its improvement.

As herein referred to, Magazine Bend is presumed to mean that portion of the river from the lower end of Lieutenant Run Dike to the lower end of Poor Run Dike. Its principal feature is the abrupt bend, from which it derives its name, with the low ground included within this bend. The chord of this bend is the location of "Steins Upper Cut," a cut-off that was projected and partially executed before the United States assumed the improvement of the river. A channel of the proposed dimensions has always been difficult of maintenance in this reach, due partly to the abrupt curve in the river and the escape of a portion of the freshet flow across the low neck of land, and partly to the change at Petersburg in the character of the Appomattox River. The latter cause can not be removed. By reopening Steins Upper Cut the former cause is removed by straightening the river. The proposed opening of this cut was rejected by the Board of Engineers of 1870, and has since been reconsidered on several occasions. It has not been considered advisable to attempt it on account of its relatively great cost and the inadequacy of the funds available for the work. The conditions in these respects remain unchanged. There remains, then, the alternative adopted by the Board, the improvement of the bend by a concave jetty or training wall. The improvement of this reach by the use of wing dams on both banks has not proved successful. The wing dams failed to accomplish the desired end, and those on the concave bank failed of permanency. A portion of the proposed concave training wall was built in the upper part of the bend in 1891, and has given good results. It is proposed to extend this wall downstream

1,500 feet to opposite the lower end of Poor Run Dike. It will serve to give a better direction to the currents, will protect the concave bank from erosion, and, with the assistance of wing dams on the convex bank, will contract the channel to a width of 140 feet, the greatest practicable width for a self-maintaining channel in this reach of the river as shown by experience. This training wall, and others proposed on this project, is designed to be of piles, with brush filling, as used on this river and on the James River. It is expected that at the apex of the curve some difficulty will be experienced with this form of construction on account of the rocky character of the bottom, and that some other form will have to be adopted for that portion of the wall. Allowance is made in the estimates for this more expensive work. It is also proposed to extend Poor Run Dike 200 feet downstream to opposite wing dam No. 1, in order to continue the contraction of the channel to that point.

The reach from Poor Run Dike to the head of Puddledock Cut has been improved by contraction works and with good results to the channel. Pages Bar has been obliterated by the action of these works, and, excepting at the lower end of the Closure Dike, a channel depth of 12 feet and over is maintained nearly throughout this reach. The channel has not, however, a sufficient width, and, on account of irregularities in its position, is not available at all points to its full width and depth. These deficiencies are due to a too great distance between the contracting wing dams and to an excessive width at some points. That portion of the channel between wing dams 18 and 20, where the excessive distance between wing dams has been corrected by the construction o wings on their channel ends, and where the excessive channel widtl has been reduced to 140 feet by the construction of a training wall o the concave bank, has an ample width and depth. It is proposed t produce a similar condition for the remainder of this reach by constructing wings at the channel ends of such wing dams as require them and by building training walls or wing dams, where necessary, to contract the width to 140 feet. The work proposed includes the construction of wings 90 feet long at the ends of wing dams 1 to 14, inclusive and the repair of the wings at the ends of others of the wing dams, th extension of Hares Dike 250 feet upstream and 200 feet downstrean and the extension of Joiners Spring Dike 800 feet up-stream and 1,20 feet downstream.

Puddledock Cut shows a gradual shoaling, but still has a channel d ample dimensions, excepting at and above its upper end, in the neighborhood of the Closure Dike. This shoal is due to the escape of a portio of the freshet flow over the Closure Dike into the old channel and constantly reforms during freshets. It is hoped that the construction o a dam, now nearly completed, for retaining in the channel freshets o average height and forcing their flow through the cut, will tend in par to prevent the formation of this shoal and assist in maintaining the dept in the remainder of the cut. No other work is at present projected fo this reach.

The South Channel has been contracted throughout its length b wing dams, and works have been constructed to prevent the escape o water over the low lands into the old channel. These works have bee beneficial to the channel, but have not produced the full effect desired due mainly to an insufficient contraction of the channel. An examination of Puddledock Cut, in which the conditions of flow do not diffe materially from those existing in the South Channel, and of such portions of the South Channel as have a satisfactory cross section, shows hat a width of from 170 feet to 180 feet is all that this reach of the iver should have, whereas the present channel averages from 230 to 50 feet in width. It is proposed to contract it to a width of 170 feet y a training wall extending 2,200 feet downstream from the lower end f Puddledock Cut and by wing dams from the end of this training all to the mouth of the South Channel. Certain small items of work re also necessary to close breaks in works that prevent the escape of he water into the old channel.

In the reach from the mouth of the South Channel to Point of Rocks here have never been any works of permanent improvement with the xception of a dam to close the chute behind Sunken Island. This each has an excessive width in that portion above Sunken Island with onsequent deficient depths. It is proposed to practically continue the outh Channel 1,200 feet downstream by a training wall of that length hich will serve to make more easy the confluence of the water of the wo channels at that point. Also to construct another training wall, ommencing below the end of the first, to contract the channel to a idth of 350 feet down to the head of Sunken Island. This width gives channel of satisfactory dimensions at Sunken Island.

On the accompanying map are shown the existing works for the mprovement of the river and those proposed in this project. These roposed works will improve the condition of the navigable channel nd render it more constant and easy of maintenance. It is not xpected that even upon the completion of the system of works herein roposed that the annual charge for the maintenance of this channel ill disappear. The existing and the proposed works are of timber nd only semipermanent, and will require constant repair of damages by freshets and deterioration. The channel that is provided is for rdinary stages of the river and is subject at points to changes by hoaling during freshets from the different conditions then existing. t is not possible to await the removal of these shoals by the slow action f the relatively small tidal currents of ordinary stages, and resort ust be had to the dredge for the relief of the commerce of the river. The Board of Engineers of 1870 recognized, as a resultant of the liability f the Appomattox River to freshets, the necessity for the more or less onstant use of the dredge to maintain the artificial channel. Ten housand dollars per annum, the amount estimated by the Board for his purpose and for repairs to works, is included in the following stimates as necessary annually, in addition to the amounts estimated s required to complete the proposed works. While the construction f the proposed works will reduce the annual charges for the redredging f shoals, the increasing number of works and their increasing age ill increase the annual cost for their maintenance.

The estimate of cost is as follows:

agazine Bend:	
Extension of training wall, 1,500 feet pile and brush dike, at $4.50..	$6,750.00
Extension of Poor Run Dike, 200 feet pile and brush dike, at $3.....	600.00
etersburg Channel:	
Extension of Hare's Dike, 450 feet pile and brush dike, at $3..........	1,350.00
Extension of Joiner's Spring Dike, 2,000 feet pile and brush dike, at $3	6,000.00
Wing dams 1-17, 1,310 feet sheet-pile dams, at $3.50..................	4,585.00
outh Channel:	
Training wall, 2,200 feet pile and brush dike, at $3..................	6,600.00
xtension of Rushmore's Dike:	
200 feet pile and brush dike, at $3......................................	600.00
44 wing dams, 935 feet sheet-pile dams, at $3.50........................	3,225.00
1,910 feet wattle dams, at $1..	1,910.00
Minor works and repairs..	1,000.00

Sunken Island Channel:	
Training walls, 3,700 feet pile and brush dike, at $3	$1
Total	4
Add for engineering and contingencies 10 per cent	
Aggregate	4
For maintenance and repairs during year ending June 30, 1894	1
For maintenance and repairs during year ending June 30, 1895	1
Aggregate	6

In the above estimate the price per unit for the different cla work includes the cost of the necessary mattress protection.

Very respectfully, your obedient servant,

EDW. BURR,
First Lieut., Corps of Engin

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. William P. Craighill, Corps of Engineers, Di Engineer, Southeast Division.

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., June 15, 1

Respectfully submitted to the Chief of Engineers and recomm for approval. If the amount of the original estimate had been a ble for prompt expenditure, the improvement could have been sat torily completed within it. It was always understood that a sum would be needed annually for repairs. This need for repa not a peculiarity of works of river and harbor improvement, b equally applicable to railways, streets, public roads, etc. If negl their cost increases, and to execute them with money expected applied to the original improvement tends to increase its app cost.

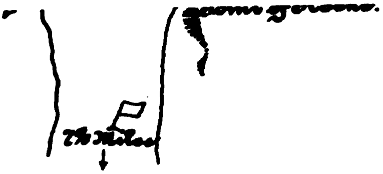
The improvement of the Appomattox River, considering all its cir stances, has been a very successful one. It is only necessary in to come to this conclusion, to compare its condition in 1865 with of 1893. Another indication of the truth of this conclusion is whereas it was necessary twenty years ago to dredge continua very little annual dredging is now required.

There has been complaint that the available depth is not gre The river is a comparatively small one and great depth can onl secured by great contraction or perpetual dredging. If the con tion is carried beyond a certain limit, the width of the channel bec so small as to be an impediment to the use of large vessels for na tion. Continued dredging is expensive and the presence of dre in a narrow channel is also a hindrance to navigation. The rati system of improvement for a small river like this is therefore the of works of contraction such as will give a reasonable depth and w of channel, with the occasional use of the dredge to a limited e when required.

A depth of 11 or 12 feet at high water can be easily maintaine regulating works and the occasional use of the dredge.

This depth seems to be about as much as the small commerce of port requires.

WM. P. CRAIGHILL,
Colonel, Corps of Engineer



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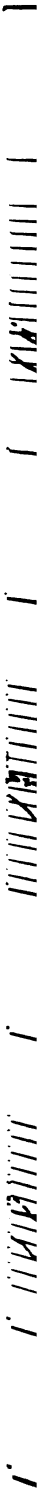
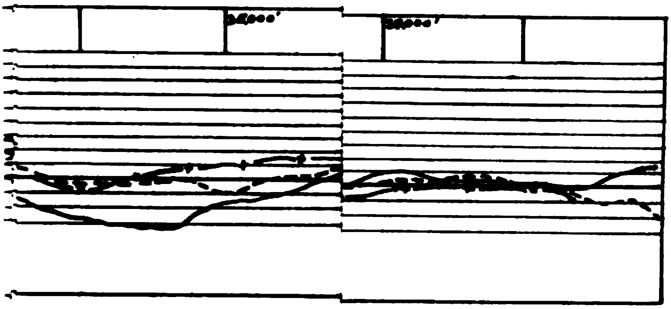
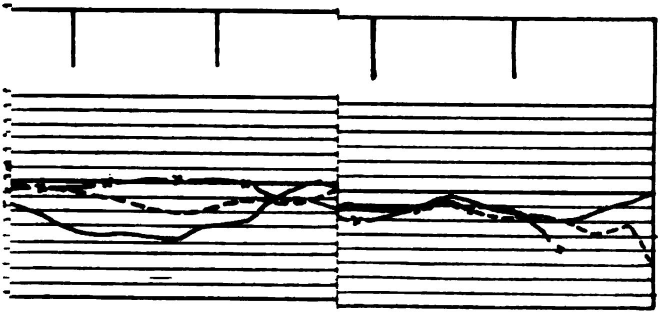
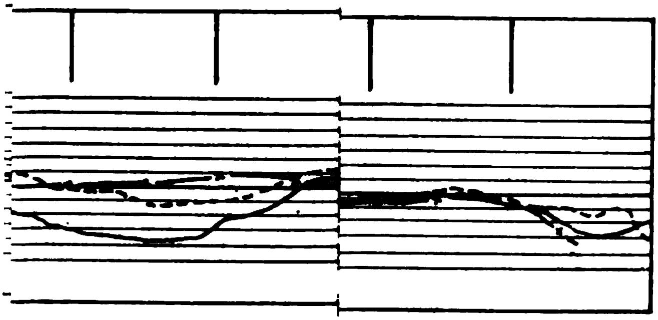
olk, Va. June 8, 1893.
y report of this date.
Edw. Burr
Lieutenant Corps of Engineers.









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IPROVEMENT OF INLAND WATER ROUTE FROM NORFOLK, VA., TO ALBEMARLE SOUND, NORTH CAROLINA, THROUGH CURRITUCK SOUND.

This water route is one of the most important links in the chain of land water communication along the Atlantic coast. It connects hesapeake Bay with Albemarle Sound, and is composed of the follow-g bodies of water, viz, Elizabeth River, North Landing River, Cur-tuck Sound, Coanjok Bay, North River, and the Albemarle and Ches-peake Canal. With the exception of the canal, all are natural water-ays, and previous to the act of September 19, 1890, which contained n item of $10,000 for this route, these waterways had been separately nder improvement.

The Elizabeth River, 11.9 miles long, was under improvement be-veen 1873 and 1878. At a cost of $40,180 a channel 60 feet wide and feet at low water was secured.

The North Landing River, 17 miles long, was under improvement etween 1879 and 1887. At a cost of $49,777.34 a channel 80 feet wide nd 9 feet deep was secured.

Currituck Sound, Coanjok Bay, and North River Bar, 13½ miles, were nder improvement between 1879 and 1890. At a cost of $141,656.16 channel 80 feet wide and 9 feet deep was secured through the sound, nd a channel 40 feet wide of the same depth through the bay and over e bar.

Before any improvement was undertaken by the Government there as over this route an indifferent channel 5 to 7 feet deep at low ater, the navigation of which was obstructed by overhanging growth, ags, and sharp bends in all the rivers. The project adopted for the nprovement was to secure a channel 80 feet wide and 9 feet deep at w water over the entire route, about 58 miles, by dredging, by remov-g obstructions, and by constructing a dike.

Steady progress is making toward securing the projected channel, nd at present the regular steamboat lines running between North arolina ports and Norfolk and Baltimore employ vessels whose maxi-um dimensions are: Length, 190 feet; width, 25.2 feet; draft, 8 feet, d tonnage, 421 tons.

The amount expended on this improvement to June 30, 1892, including e cost of the several separate items as noted above, was $243,832.28. cluding also the expenditures to June 30, 1892, for logging operations the North Landing River, in addition to the above items, $3,057.35, e total expenditures on this route to that date are $246,889.63.

Nine thousand dollars was appropriated for this improvement by act July 13, 1892. A contract was entered into on March 18, 1893, with hester T. Caler, of Norfolk, Va., to do the work at 13½ cents per cubic ard, for dredging in North River, and 29 cents per cubic yard for edging on North River Bar. The work is to be commenced before anuary 15, 1894, and to be completed by April 30, 1894.

The amount expended on this improvement during the fiscal year ding June 30, 1893, was $38.83, applied to office expenses, reading de gauges, etc.

APPROPRIATIONS.

or South Branch, Elizabeth River, Virginia:	
March 3, 1873	$15,000
June 23, 1874	10,000
March 3, 1875	5,000
August 14, 1876	5,000
June 18, 1878	5,000

For North Landing River, Virginia and North Carolina:	
March 3, 1879	$25,00
June 14, 1880	15,00
March 3, 1881	7,50
August 2, 1882	8,00
For Currituck Sound, Coanjok Bay, and North River Bar, North Carolina:	
June 18, 1878	20,00
March 3, 1879	25,00
June 14, 1880	25,00
March 3, 1881	30,00
August 2, 1882	20,00
July 5, 1884	5,00
August 5, 1886	10,00
August 11, 1888	7,50
For inland water route, etc.:	
September 19, 1890	10,00
July 13, 1892	9,00
Total	257,00

Money statement.

July 1, 1892, balance unexpended	$738.5
Amount appropriated by act approved July 13, 1892	9,000.0
	9,738.5
June 30, 1893, amount expended during fiscal year	38.8
July 1, 1893, balance unexpended	9,699.7
July 1, 1893, amount covered by uncompleted contracts	8,800.0
July 1, 1893, balance available	899.7
Amount (estimated) required for completion of existing project	49,667.0
Amount that can be profitably expended in fiscal year ending June 30, 1895	49,667.0
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

Abstract of proposals for dredging in inland water route from Norfolk, Va., to Albemar Sound, North Carolina, through Currituck Sound, opened January 26, 1893, by Lieu Edward Burr, Corps of Engineers.

No.	Name and address.	Time.		Number and kind of machines.	Daily amount guaranteed.	Price per cubic yard.	
		Commence.	Complete.				
					Cu. yds.		
*1	Atlas Dredging Co., Wilmington, Del.	Nov. 1, 1893	Apr. 30, 1894	1 grapple dredge.	....	25 40	North Riv North Riv Bar.
2	Rittenhouse Moore Dredging Co., Mobile, Ala.	5 months after approval of contract.	90 days.....	1 clam-shell drege.	500	22 35	North Riv North Riv Bar.
3	C. P. E. Burgwyn, Richmond, Va.	60 days after notification.	Apr. 30, 1894	1 dipper dredge.	300	25½ 74	North Riv North Riv Bar.
†4	Chester T. Caler, Norfolk, Va.	Jan. 15, 1894	....do	....do	800 800	13½ 29	North Riv North Riv Bar.

Total of each bid, $8,800.

*Conditioned upon also receiving contracts for dredging in Nansemond River, Virginia, and Chi ahominy River, Virginia.

†Accepted.

COMMERCIAL STATISTICS.

[From records of Albemarle and Chesapeake Canal Company.]

umber, class, and tonnage of vessels passing through the inland water route from Norfolk, Va., to Albemarle Sound, North Carolina.

Year ending—	Steamers.	Schooners.	Barges.	Lighters.	Sloops.	Rafts.	Tonnage.
ne 30—							
1885	2,976	1,059	632	133	204	181	....
1886	3,271	1,082	549	55	178	244	336,737
1887	3,369	1,216	568	49	181	297	358,111
1888	3,862	1,362	361	44	265	378	435,745
1889	4,065	1,539	683	82	352	352	445,237
n 1—							
1890	4,160	1,699	878	67	446	335	454,950
1891	4,068	1,304	1,000	113	394	350	456,442
1892	4,061	1,817	1,150	62	329	298	467,113
1893	4,026	1,077	1,109	82	281	350	440,319

Approximate amount of all kinds of freight passing through this route.

	Tons.
888	335,758
889	372,617
890	403,111
891	328,609
892	281,542

K 7.

MPROVEMENT OF NORTH LANDING RIVER, VIRGINIA AND NORTH CAROLINA.

This river forms one of the links of the "inland water route from orfolk, Va., to Albemarle Sound, North Carolina, through Currituck ound," described above.

Before improvement the navigation of this river was obstructed by hoals, over which the depth was 6 feet at low water, by snags, and by harp bends.

The plan of improvement adopted in 1879 was to secure a channel 80 et wide and 9 feet deep at low water by dredging shoals and remov- g bends and obstructions, from North Landing Bridge to Ferraby land in Currituck Sound, a distance of 17 miles.

This channel was obtained and the project completed June 30, 1884, t a cost of $49,777.34. Since that time $3,057.35 has been expended n this river in removing sunken logs, which have been detached from assing rafts, making the total expenditures on this improvement to une 30, 1892, $52,834.69.

The river was again cleared of sunken logs in August and Septem- er, 1892, these obstructions having by that time become troublesome navigation. Twelve miles of the river were covered by these perations and there were removed 624 sawlogs, 25 stumps, 6 trees, nd 3 piles.

The method adopted for rafting logs in these waters is very faulty, sulting in a considerable loss of logs to the owners and a material bstruction to navigation on this river and the connecting portions of e "inland water route," by decreasing the available navigable depth by at least 1 foot and by remaining a menace to the hulls and the propellers of passing vessels. It is to be regretted that no means are available for controlling this traffic.

There was expended on this improvement during the fiscal year ending June 30, 1893, $1,152.50, applied as noted above. The only operations contemplated for the present are the removal of sunken obstructions from time to time. The balance on hand will suffice for this purpose and no further appropriation is needed.

For commercial statistics, see report on improvement of "inland water route," etc.

APPROPRIATIONS.

March 3, 1879	$25,000
June 14, 1880	15,000
March 3, 1881	7,500
August 2, 1882	8,000
Total	55,500

Money statement.

July 1, 1892, balance unexpended	$2,665.31
June 30, 1893, amount expended during fiscal year	1,152.50
July 1, 1893, balance unexpended	1,512.81

K 8.

REMOVAL OF SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGERING NAVIGATION.

Wrecks of schooners Lulu, Edith Berwind, and Mary E. H. G. Dow.—The three-masted schooner *Lulu* went ashore on the Horseshoe, Chesapeake Bay, ENE. 2½ miles from Thimble Shoal Light. She was built in 1873 at Wattleboro, Me., and her dimensions are: Length, 136 feet; beam, 32 feet; depth, 15 feet; registered tonnage, 451 tons; is built of wood and when wrecked was laden with coal.

The four-masted schooner *Edith Berwind* went ashore on Nautilus Shoal, Cape Charles, Virginia, 4¾ miles SSW. from Cape Charles Light and 1¼ miles E. of Nautilus Shoal Buoy No. 2. She was built in 1889 at Coopers Point, New Jersey, and her dimensions are: Length, 177 feet; beam, 39 feet; depth, 16 feet; registered tonnage, 815 tons; is built of wood and when wrecked was laden with phosphate rock.

The four-masted schooner *Mary E. H. G. Dow* went ashore on the Outer Middle Ground, Cape Charles, Virginia, 1 mile SE. of Middle Ground Buoy No. 4. She was built in 1892 at Bath, Me., and her dimensions are: Length, 203 feet; beam, 33 feet; depth, 19 feet; registered tonnage, 1,138 tons; is built of wood and when wrecked was laden with coal.

These three wrecks were reported as obstructing and endangering navigation, and, when it became evident that their owners did not intend to remove them, a project for their removal at a cost (estimated) of $1,500 for the *Lulu*, $3,000 for the *Edith Berwind*, and $2,500 for the *Mary E. H. G. Dow*, was submitted for approval and their removal authorized. The thirty days' notice required by law was published on May 6, 1893, and proposals for removing the three wrecks were opened on June 6, 1893.

A contract was entered into on June 19, 1893, with the lowest bidder, W. H. French, of Norfolk, Va., for their removal at a cost of $1,500 for the *Lulu*, $1,700 for the *Edith Berwind*, and $1,800 for the *Mary E. H. G. Dow*. The work is to be commenced by July 1, 1893, and completed by August 31, 1893.

Abstract of proposals for removing wrecks of schooners Lulu, Edith Berwind, and Mary E. H. G. Dow, opened June 6, 1893, by Lieut. Edward Burr, Corps of Engineers.

Name and address.	Lulu.	Edith Berwind.	Mary E. H. G. Dow.	Total.
Charles W. Johnston and Enoch Townsend, Somers Point, N. J	$4,150	$5,965	$5,230	$12,345
W. H. French, Norfolk, Va	†1,500	1,700	1,800	5,000
Merrit Wrecking Organization, Norfolk, Va				11,000
Chapman Derrick and Wrecking Co., New York, N. Y				36,875
John McK. Grant, Charleston, S. C				12,000

* Accepted.

† Clause if bidder be permitted to retain such portion of wreck as may be saved.

K 9.

PRELIMINARY EXAMINATION OF HARBOR AT PETERSBURG AND APPOMATTOX RIVER, VIRGINIA, FOR DIVERSION OF WATERS TO OLD NORTH CHANNEL ABOVE CITY.

[Printed in House Ex. Doc. No. 113, Fifty-second Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 5, 1892.

SIR: I have the honor to submit herewith a copy of report, dated October 8, 1892, by Lieut. Edward Burr, Corps of Engineers, of the results of preliminary examination of harbor at Petersburg and Appomattox River, for diversion of waters to Old North Channel above city, made to comply with provisions of the river and harbor act approved July 13, 1892.

I concur in the views expressed by the local and division engineers that the river is not worthy of improvement by the General Government in the manner mentioned in the act.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

HON. S. B. ELKINS,
Secretary of War.

REPORT OF LIEUT. EDWARD BURR, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Norfolk, Va., October 8, 1892.

GENERAL: I have the honor to transmit herewith a report of an examination and survey of harbor at Petersburg and Appomattox

River, Virginia, for diversion of waters to Old North Channel above city assigned to me by Department letter of July 14, 1892.

* * * * * * *

Very respectfully, your obedient servant,

EDW. BURR,
First Lieut., Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. William P. Craighill, Corps of Engineers, Division Engineer, Southeast Division.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., October 11, 1892.

Respectfully submitted to the Chief of Engineers.

My opinion on this subject was given in some detail several years ago. (See pp. 955, 956, Annual Report of Chief of Engineers, 1889 Part II.)

I concur in the conclusions of Lieutenant Burr in his report of October 8, 1892. In view of the present as well as the prospective needs o commerce, so far as I can foresee them, I am unable to consider th diversion scheme for the Appomattox as required, and I therefore say in the words of the law, that the stream is not worthy of improvemen by the General Government in that way.

WM. P. CRAIGHILL,
Colonel, Corps of Engineers.

REPORT OF LIEUT. EDWARD BURR, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Norfolk, Va., October 8, 1892.

GENERAL: In compliance with the provisions of the river and ha bor act of July 13, 1892, I have the honor to submit the following repo of an examination and survey of "harbor at Petersburg and Appoma tox River, Virginia, for diversion of waters to Old North Channel abo city," with estimate of cost.

This project has previously been the subject of two reports. The fir was made in 1882 by Captain Turtle, Corps of Engineers, U. S. Arm and is to be found in the Annual Report of the Chief of Engineers f 1882, Part I, p. 907 *et seq.* The second was by Lieutenant Fiebeger, Cor of Engineers, U. S. Army, and is given in the Annual Report of t Chief of Engineers, U. S. Army, for 1889, Part II, p. 955 *et seq.* Bot reports had the indorsement of Colonel Craighill, Corps of Enginee U. S. Army, and were based upon surveys made under the direction o Captain Turtle in 1881–'82.

The Appomattox River may be divided into two parts having distin and different characteristics. The lower and navigable portion is tidal stream having the characteristics common to all such streams the lowlands of this section, and extends from the mouth at City Poi to Petersburg, a distance of 11¼ miles, 7⅝ miles of which have bee under improvement. Above Petersburg the river is nontidal, and n navigable. Both sections are subject to sudden freshets, which ari in the upper part of the stream. These freshets bring down from the upper part of the stream large quantities of sand, which is deposited in the harbor of Petersburg and as shoals in the channel where the velocity of the current is from any cause slackened. The wharves in the city of Petersburg and the lowlands bordering the river are subject to overflow during freshets.

To avert this shoaling of the harbor and channel and the flooding of the wharves with each recurring freshet is the object of the proposed diversion from the navigable channel of the flow from the upper river. It is proposed to convert the navigable channel into a purely tidal stream by carrying the nontidal flow in a separate artificial channel, diverting it from the present channel above Pocahontas Bridge and emptying it some 2¼ miles below into the old channel, whence it will find its way into the navigable channel at natural deep water at Point of Rocks.

In so far as concerns the flooding of the city wharves and the river bottom, this report has nothing to do. The flooding is due essentially to natural causes, and is one of the dangers to which all property located on the banks of freshet streams is subject. Such constructions as have been placed in the stream for its improvement and which rise only to the level of tidal high water can have but little, if any, influence upon the height of a freshet which tops them from 10 to 14 feet. The project will therefore be considered only in its relation to the maintenance of the harbor and the navigable channel leading thereto.

A complete survey was made in 1881–'82 of the ground covered by this project. The reports of Captain Turtle and Lieutenant Fiebeger were based upon this survey, and no further survey will be needed for the purposes of this report, as the conditions remain unchanged. Such maps as may be necessary in the consideration of the subject will be found with the report of Lieutenant Fiebeger, referred to above.

From an engineering standpoint the project is practicable and offers no peculiar difficulties. It consists in the excavation of an artificial channel, the construction of a dam to direct the water into this channel and an embankment to retain it therein, and the construction of bridges to carry wagon roads and railroads across the proposed new channel. The artificial channel naturally begins above Pocahontas Bridge, follows the low ground back of Pocahontas Hill and through the Roslyn Meadows, and ends in the old channel at the head of Puddock Cut. The embankment lies between the present and the proposed channel, being so placed as to permit of the economical use of the excavated material in its construction and to permit of a sufficient lateral spread of freshets over the adjacent low grounds. The location for the dam would be at Pocahontas Bridge.

Captain Turtle mentions plans for both complete and partial closures of the river at the dam, the latter being such as to permit at will the passage through the dam of more or less water for the purpose of flushing the tidal harbor. As explained by him, the plan for partial closure is faulty. The passage of water at freshet stages would defeat the object of the improvement, and any gates placed low enough to pass water at ordinary stages would be speedily blocked by the deposition by freshets of sediment in the dead water above the dam, to be carried into the harbor by the opening of the gates. Complete closure is not only better, but simpler.

This is provided for by Lieutenant Fiebeger, whose plan also provides for carrying off with safety a freshet equal to that of June, 1889, which exceeded by more than 6 feet any previous freshet. Since there have been no material changes in either the ground or freshet conditions subsequent to the date of Lieutenant Fiebeger's report, his plans and estimates are accepted for this present report and reference is made to his report for their details.

* * * * * * *

The elements of this scheme are an artificial channel and a dam to divert a stream subject to sudden freshets with an embankment to subsequently restrain it, all of which are liable to material damage from washing and filling if left in an unfinished state.

To carry out this improvement economically and successfully the entire amount should be available before the work is commenced.

* * * * * * *

The Appomattox River has been under improvement by the Government since 1870. The plan of improvement calls for 12 feet depth at tidal high water. The amount expended by the Government to June 30, 1892, is $404,832.73; with this amount permanent improvement has been made for 6 miles of the 7⅝ miles requiring attention, and temporary relief has been furnished to navigation by dredging shoals after freshets. The betterment of the channel for this 6 miles is permanent, and except at one point—at Swans Island, where permanent relief can only be had by a rectification of the channel—very little attention is necessary except to repair contraction works, which are of timber and only semipermanent. With the extension of these works over the entire 7⅝ miles, it is thought that the channel will practically be self-maintaining except at the point mentioned.

* * * * * * *

The effect of the diversion project would be to convert the navigable portion of the river into a tidal basin with no freshet flow save that from its immediate surroundings and the backwater from the diverted channel. Dredged channels in tidal streams are not always self-maintaining, and probably would not be so on this stream, although the amount of dredging in the channel would be less if the freshet water were diverted. The repairs necessary to the present contraction works and a small amount of dredging, besides the repairs to the diversion works, would be an annual expense. The estimated expense of maintaining the present channel is less than the interest at 3 per cent on the estimated cost of the diversion works, ignoring the subsequent annual expense of maintaining them and the tidal channel and contraction works.

Considering the present and prospective condition of the river and the relative cost of the two improvements, the project for diverting the waters of the Appomattox River to the old north channel above the city is not recommended for present adoption.

Reference has been made to the reports of Colonel Craighill, Captain Turtle, and Lieutenant Fiebeger, mentioned above, for much of the data contained herein.

Very respectfully, your obedient servant,

EDW. BURR,
First Lieutenant, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

APPENDIX L.

IMPROVEMENT OF CERTAIN RIVERS AND HARBORS IN VIRGINIA, NORTH CAROLINA, AND SOUTH CAROLINA.

REPORT OF MAJ. W. S. STANTON, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1893, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Staunton River, Virginia.
2. Roanoke River, North Carolina.
3. Pasquotank River, North Carolina.
4. Mackeys Creek, North Carolina.
5. Ocracoke Inlet, North Carolina.
6. Fishing Creek, North Carolina.
7. Pamlico and Tar Rivers, North Carolina.
8. Contentnia Creek, North Carolina.
9. Trent River, North Carolina.
10. Neuse River, North Carolina.
11. Inland waterway between Newbern and Beaufort, N. C.
12. Harbor at Beaufort, N. C.
13. Inland waterway between Beaufort and New River, N. C.
14. Waterway between New River and Swansboro, N. C.
15. New River, North Carolina.
16. North East (Cape Fear) River, North Carolina.
17. Black River, North Carolina.
18. Cape Fear River, above Wilmington, N. C.
19. Cape Fear River, at and below Wilmington, N. C.
20. Lockwoods Folly River, North Carolina.
21. Yadkin River, North Carolina.
22. Georgetown Harbor, South Carolina.
23. Winyaw Bay, South Carolina.
24. Removing sunken vessels or craft obstructing or endangering navigation.

EXAMINATIONS.

25. Potohunk River, North Carolina.
26. Durhams Estuary, North Carolina.
27. Breakwater at Beaufort, N. C.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., July 8, 1893.

GENERAL: I have the honor to transmit herewith annual reports for the fiscal year ending June 30, 1893, upon the works of river and harbor improvement under my charge.

Very respectfully, your obedient servant,

W. S. STANTON,
Major, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

L I.

IMPROVEMENT OF STAUNTON RIVER, VIRGINIA.

Work has been suspended on this river since October 18, 1889, and its improvement was stopped by authority from the Chief of Engineers, November 10, 1891, as stated in his Annual Report for 1892, pp. 1099 to 1102, for the reasons there specified; but the disposal of the plant pertaining to the improvement was postponed "until Congress has had another opportunity to further consider the subject of the improvement."

Congress having in the intervening session of 1892–'93 taken no further action regarding it, by authority from the Chief of Engineers of December 29, 1892, the plant and property pertaining to the improvement have been sold to other improvements in the district, and the proceeds of such sales, together with the balance of the appropriation, have been covered into the Treasury.

Money statement.

July 1, 1892, balance unexpended	$7,834.74
Received from sales	444.89
	8,279.63
July 30, 1893, amount expended during fiscal year	194.86
July 1, 1893, balance unexpended	8,084.77
July 1, 1893, outstanding liabilities	34.74
July 1, 1893, balance available	8,050.03

Staunton River, Virginia.

APPROPRIATED.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
March 3, 1879	$5,000	$5,000	July 5, 1884	$5,000	$29,500
June 4, 1880	7,500	12,500	August 5, 1886	10,000	39,500
March 3, 1881	5,000	17,500	August 11, 1888	5,000	44,500
August 2, 1882	7,000	24,500	September 19, 1890	8,000	52,500

EXPENDED.

To June 30—	Amount.	To June 30—	Amount.
1880	$3,897.62	1886	$28,689.17
1881	8,534.87	1887	32,613.44
1882	17,262.03	1888	38,685.04
1883	19,260.17	1889	42,034.18
1884	23,908.64	1890	44,314.53
1885	26,858.58	1891	44,553.0

L 2.

IMPROVEMENT OF ROANOKE RIVER, NORTH CAROLINA.

The project was adopted in 1872, to secure at all seasons of the year an unobstructed channel, with a least width of 50 feet from the mouth 29 miles to Weldon, with a low-water depth of 5 feet from Hamilton 6 miles to Weldon, and to clear the natural channel of snags and artificial obstructions from the mouth 62 miles to Hamilton, to the depth requisite for vessels navigating the North Carolina sounds which draw not more than 8 feet, by removing the war obstructions, snags, fallen and overhanging trees, sand bars and ledges, by dredging, the construction of training dikes, and blasting, at an estimated cost, at the high prices of that time, of $269,000.

A description of the river and a summary of the improvements made to June 30, 1892, are given on pp. 1103–1107 of the Annual Report of the Chief of Engineers for 1892.

The principal commerce is on the 62 miles up to Hamilton, the channel depth to that point being not less than 10 feet at low water, and there lying on the banks below Hamilton the towns of Williamston, Jamesville, and Plymouth, the former having a population of 781 and the three latter of 751, 346, and 1,212, respectively.

June 30, 1892, the part of the river most obstructed by snags in the channel and by leaning trees from the banks embraced about 25 miles in the vicinity of and below Hamilton and interspersed between it and Jamesville. Since September, 1892, three hoisters manned by 43 men have been in operation the greater part of the time on that part of the river. They have taken from the channel 1,297 large snags, 406 stumps, logs, and 491 trees, clearing the greater part of the worst obstructed channel, and have cleared for a width of 20 feet 17¼ miles of single bank by cutting or trimming 8,250 trees and removing 422 snags and stumps to prevent them all from being carried into the channel by the caving of the soft banks and the leaning trees from interfering with boats.

In ascending the river the channel first becomes shallow at Indian Highland Bar, 5 miles above Hamilton and 67 miles above the mouth, but there is now from Hamilton up to a point 1¼ miles below Weldon the depth of 5 feet prescribed in the project, except upon a sand bar about 150 feet long at Spring Gut, 21 miles above Hamilton, and upon a sand bar about 1,600 feet long, with a rocky point about 100 feet across at Halifax, 57 miles above Hamilton. At these localities an increase of depth of not more than 1 foot is necessary to obtain 5 feet at low water, assumed at the zero of the Weldon gauge, which was the lowest recorded stage of water from February 1, 1875, to June 30, 1876, from May to December 30, 1889, and during 1891, 1892, and 1893, a period of four years and eleven months.

On a sand bar 800 feet in length, about 1¼ miles below Weldon, the depth is somewhat less, and on a ledge of rock extending from the old Weldon Ferry 2,850 feet up to the old Weldon Landing the depth is about 1 foot less than that prescribed in the project.

At Looking Glass Bar, which is of sand and 41 miles above Hamilton, the channel is of the prescribed depth but only from 30 to 70 feet wide.

By indorsement of May 14, 1890, from the office of the Chief of Engineers, $6,000 were allotted for application to dredging a cut-off 1,100 feet in length at Shad Island Bend, 29½ miles above the mouth of the river, of which about $1,000 were applied in July, 1890, to clearing the site of trees and stumps and in dredging a cut 23 feet wide, 7 feet to about the level of low water and 150 feet long, when the wor suspended. Its resumption has been long delayed to await the veyance to the United States of a title to the site, which has bee tained, and contract will be entered into for the dredging, together one or two other small amounts of like work on neighboring imp ments.

The cut will be dredged with the remaining $5,000 of the $6,00 lotted only to a partial cross section of the channel desired, leavin to be enlarged by scour.

The bend is a double one, very sharp, and very seriously embarra navigation by the larger steamers on the river.

From a point about 8 miles below Hamilton, at intervals down a 21 miles to Cades Eddy, the removal of snags from the channel and clearing of the banks at bends are requisite. From a point 7 m above Hamilton up to a point 43 miles above it the trimming of miles of single bank is needful. Otherwise the river is in good n gable condition.

In the fiscal year only two steamers of 35 and 100 tons gross tonn ascended the river above Hamilton, going as far as Edwards Ferry, miles above it; and Nicks Landing, 51 miles above Hamilton, is highest point to which boats have recently run.

At the close of the year but one small steamer is reported as runn above Hamilton.

The river is paralleled by railroads, and shippers report that rates by rail are about the same as by water, and that consequen the roads get the bulk of the freights. The Roanoke, Norfolk a Baltimore Steamboat Company are reported to have abandoned th route from Hamilton to Norfolk, taking off the river four of th steamers. A narrow-gauge railroad has been taken up which forme ran from Hamilton to Tarboro and was a feeder to the river boats.

The diminution in freight carried on the river, from a comparison the commercial statistics accompanying this report with those whi accompanied the report for last year, is attributable to the foregoi causes and possibly to errors in collecting the statistics, which it is ve difficult to do with accuracy. The statistics for the preceding ye may have been exaggerated while those for this year may show som what too little freight, although they have been collected as accurate as possible.

About all the freight carried down the river from Hamilton and Pl mouth is taken by steamers to Edenton, whence it is shipped by t Norfolk and Southern Railroad to Norfolk, but some lumber is se from the river by boats to Elizabeth City and some to Norfolk by cana

Shippers report that "it is of great advantage to us to have th river in good condition, as it gives us the chance to have boats so tha we are enabled to keep the rates by rail down to a fair price."

Vessels can reach the mouth of the Roanoke from the sea only b the Albemarle and Chesapeake Canal and Hatteras or Ocracoke Inlet through none of which can a draft of more than 7 feet be carried, an from Pamlico Sound only by Croatan Sound, through which 8 feet ca be carried in calms, 7 feet in northerly winds, and 9 feet in southerl winds.

The balance now available of the $50,000 appropriated by the ac of July 13, 1892, is adequate for all requirements during the fiscal yea ending June 30, 1895.

The river is in the collection district of Edenton, N. C.

to the utility to coastwise navigation of Ocracoke Inlet and the proposed improvement, especially as in the report (p. 1120, Annual Report Chief of Engineers, 1889) embodying the original project, importance is attached to the improvement as affording coasting vessels access through the inlet to Royal Shoal Harbor, in Pamlico Sound, as a refuge from the noted perils of Cape Hatteras and vicinity.

Finding, in the published appropriations and expenditures by the United States for rivers and harbors from 1789 to 1882, that the sum of $133,732.40 was expended for the improvement of Ocracoke Inlet from 1826 to 1837, the reports and correspondence, embracing 100 type-written pages, descriptive of the operations of those years were obtained and copied from the files in the office of the Chief of Engineers.

The project of 1827, by Capt. Hartman Bache, Topographical Engineers, was to dredge Flounder Slue to the depth of 10 feet and width of 400 feet, entailing the removal of 140,864 cubic yards, and thus obtain, with Wallace Channel, from the slue to the inlet, and with that part of the ship channel from the slue westerly to the sound, a continuous channel 10 feet in depth from the inlet through the inner shoals, to the sound. At that time the alternative was considered of adopting the ship channel entire and of dredging the two shoals, namely, the "Swash" and the "Bulkhead," that obstructed its easterly part, instead of dredging Flounder Slue. (See Chart of 1830). But Flounder Slue was adopted for reasons stated in the reports, as follows: Its direction was more favorable with regard to the prevailing winds; it afforded the nearer and more direct communication with the sea; it was protected by the islands to the northeast; unlike the "Swash" and the "Bulkhead," it was without cross currents; it had previously been the best channel until "destroyed by abuses in the navigation," consisting in the formation of numerous knolls and irregularities by grounding vessels in it and kedging them through it and in dumping ballast in it. (Report of Capt. Hartman Bache, 1827.)

When, in August, 1830, dredging was commenced at Flounder Slue "it was not considered practicable for more than 5 feet; in 1835 its depth had been increased to 8¼ feet at low water on the shoalest part for an average width of 120 feet," and it had "for a year previous become the principal channel for vessels from Pamlico and Neuse rivers."

In 1831 shoaling was observed at the mouth of Wallace Channel, and Beacon Island Slough was adopted instead of that part of Wallace Channel east of their junction. In 1835 Lieut. Swift reported that the mouth of Wallace Channel had become much shoaler but that vessels drawing 8 feet still passed out at high water, and that about the year 1818 it had been in a worse condition. In 1837 he reported that its mouth had become so shoal as to prevent its being used, and that where twelve months before there was 8 feet of water there was then (October, 1837) not more than 4. This part of Wallace Channel is now shown as a blind channel on Lieut. Lucas's map.

In 1831 Lieut. Dutton reported that the depth of water on the bulkhead in Beacon Island Slough was 6 feet at flood tide; and in 1832 he reported that by six weeks' dredging in August and September of that year it had been increased to a depth varying from 8¼ to 9 feet at flood tide and a width of 50 yards, so that vessels of the draft of water usually employed in that navigation could readily pass through the slough.

In his report for 1832 Lieut. Dutton remarked: "The most favorable circumstance attending the operations is the apparent permanency of the work already executed, contradicting in this essential point the opinions generally entertained, and affording the surest guaranty of the eventual success of the work."

November 23, 1833, it was reported "that from Wallace Channel" (doubtless at Beacon Island Slough) "about 34,000 yards of earth had been removed within a year,' and that navigation of 8 feet had been obtained "through it."

November 1, 1834, in transmitting to Congress the whole report of the officer charged with the improvement, it was stated that "operations had been continued with perseverance; that 35,300 yards of earth had been excavated; that though the operations had been but partially successful they had nevertheless been productive of a decided and useful improvement in the navigation; 'that there were circumstances, however, arising out of the peculiar nature of the locality which, according to the experience of the last season, are such as to create strong doubts of the practicability of improving this navigation to the extent desired by those interested in its improvement, the principal object having been to obtain a draft of 10 feet at high tide.'" It was there further said: "'The causes here alluded to are the uncertain and shifting character of the shoals lying near the inlet.' The effect produced at some of the channels, the disappearance of much of the work, and the reappearance of some of the bars are described and the inference drawn that the permanent improvement by dredging for a greater depth of water than that then existing in Wallace Channel was uncertain, if not impracticable."

In his report of September 30, 1835, Lieut. Alexander J. Swift said: "To turn the course of the ebb tide in Wallace Chanel by means of a jetty over the strip of shoal separating this channel from Beacon Island Slough and the roads is the course which I propose in order to form a good mouth," his jetty being designed to accom-

plish what it had been the endeavor to accomplish by dredging in Beacon Island Slough.

October 30, 1837, Lieut. Swift reported: "This jetty was commenced in the latter part of last March and was very nearly completed when the gale of the 18th and 19th of August very materially injured it. Such was the extent of the injury that it was thought inexpedient to prosecute the work. * * * The changes which are continually taking place in the navigation of Ocracoke Inlet may at some future time present an opportunity of permanently improving it at but little expense, but such is its exposed situation that I *now* regard the possibility of any *immediate* improvement as very doubtful, and therefore respectfully recommend to the Department a cessation for the present of the operations there."

There is no record of further operations, and such is the result of the expenditure by the Government of $133,732.40 for the improvement of Ocracoke Inlet from 1826 to 1837.

Briefly to recapitulate it: After a very careful selection of the channel to be made dredging commenced in 1830; in 1832 the engineer, Lieut. Dutton, considered the two years' experience as "affording the surest guarantee of the eventual success of the work;" after another two years, in 1834, the engineer stated that the experience of the last season was such as to create strong doubts of the practicability of improving "this navigation to obtain a draft of 10 feet at high tide;" finally, after a further experience of three years, and a total experience of seven years from the commencement of dredging, "the possibility of any immediate improvement" was regarded "as very doubtful," and the work ceased.

Among the responses to the circulars issued in May were some from mariners long familiar with the inner shoals, very positively asserting that while the material to be dredged in extending Wallace Channel is sand so shifting as to threaten the speedy closing of any channel dredged through it, and the depth of water only about 6 feet, at Ocracoke Swash, which had not changed for fifty years, the bottom was stiff mud, with a least channel depth of 7½ feet, and that to obtain the requisite draft of water from the inlet through the inner shoals to the sound, the channel to be dredged at the Swash would be only about one-fourth as long as that to be dredged at Wallace Channel.

It is understood that the survey made in February, March, and April, 1891, and upon which the present project was based, did not embrace Ocracoke Swash, for the reason that Teachs Hole Channel, through which vessels must pass to navigate the Swash Channel, had been several times choked up with sand at its mouth near the point of Ocracoke Island. However, as Ocracoke Swash is the only channel now and for several years past navigated by vessels crossing the inner shoals, and through which they can draw 7½ feet, in view of all the foregoing it was deemed by me expedient to extend the survey to embrace it for careful comparison with Wallace Channel before commencing work upon the improvement of the latter.

Such further survey was authorized by letter from your office of July 23, 1892, and was made in September and October by my assistant, First Lieut. E. W. Van C. Lucas, Corps of Engineers, whose report of February 18, 1893, with plot in three sheets, is herewith transmitted. Lieut. Lucas took upwards of 16,000 soundings, extending not only over Ocracoke Swash but over the area of the proposed dredging in Wallace Channel, for the purpose of a more accurate estimate of the quantities of dredging necessary to obtain the depths of 10, 12, 14, and 15 feet than could be made from the smaller number of soundings taken during the unfavorable conditions of weather and sea in March and April, 1891.

Lieut. Lucas finds that to obtain a depth of 12 feet through the Ocracoke Swash Channel will require dredging through five shoals an aggregate length of 17,600 feet and the excavation of 480,800 cubic yards, while to obtain 12 feet through Wallace Channel the length of dredging would aggregate 9,500 feet through two shoals and the amount of excavation would be 422,577 cubic yards. To obtain a depth of 10 feet from inlet to sound requires by Ocracoke Swash Channel dredging through three shoals a total length of 9,100 feet and the excavation of 162,265 cubic yards, and by Wallace Channel dredging through two shoals a total distance of 6,885 feet and the excavation of 232,487 cubic yards. Allowing an average of 6 inches excess of depth in dredging, the amount of excavation would be in Ocracoke Swash Channel 212,265 cubic yards and in Wallace Channel 271,565 cubic yards, a difference of 59,300 cubic yards measured in situ) in favor of the Ocracoke Swash route, amounting, at the present contract price, 17 cents per cubic yard, measured in scow (equivalent to 21¼ cents per yard in situ, assuming an increase of 20 per cent in the scow), to $12,601.25.

Lieut. Lucas found by boring to the depth of 12 feet below low water that the material at the Swash is not stiff mud but a very fine sand, with a slight admixture of mud, and differing only by this admixture from the fine sand in Wallace Channel. Furthermore, a strong current at both ebb and flood sets across the channel that would be dredged at the Swash, an objection not found in Wallace Channel.

becoming the owner of 800 shares of the capital stock, the whole number of which was 1,944 shares. From these 800 shares there were paid into the Treasury of the United States dividends to the amount of $98,497.58. In 1862 the Government seized the canal and used it to great advantage for three years until the close of the war, when it was surrendered to the company, it is reported, "in a condition of great dilapidation, the effect jointly of neglect and hard usage." About 1878, Congress taking no action upon report made to it, the canal was sold to redeem bonds issued to provide funds for its repair and improvement after the war, and the United States ceased to be a stockholder.

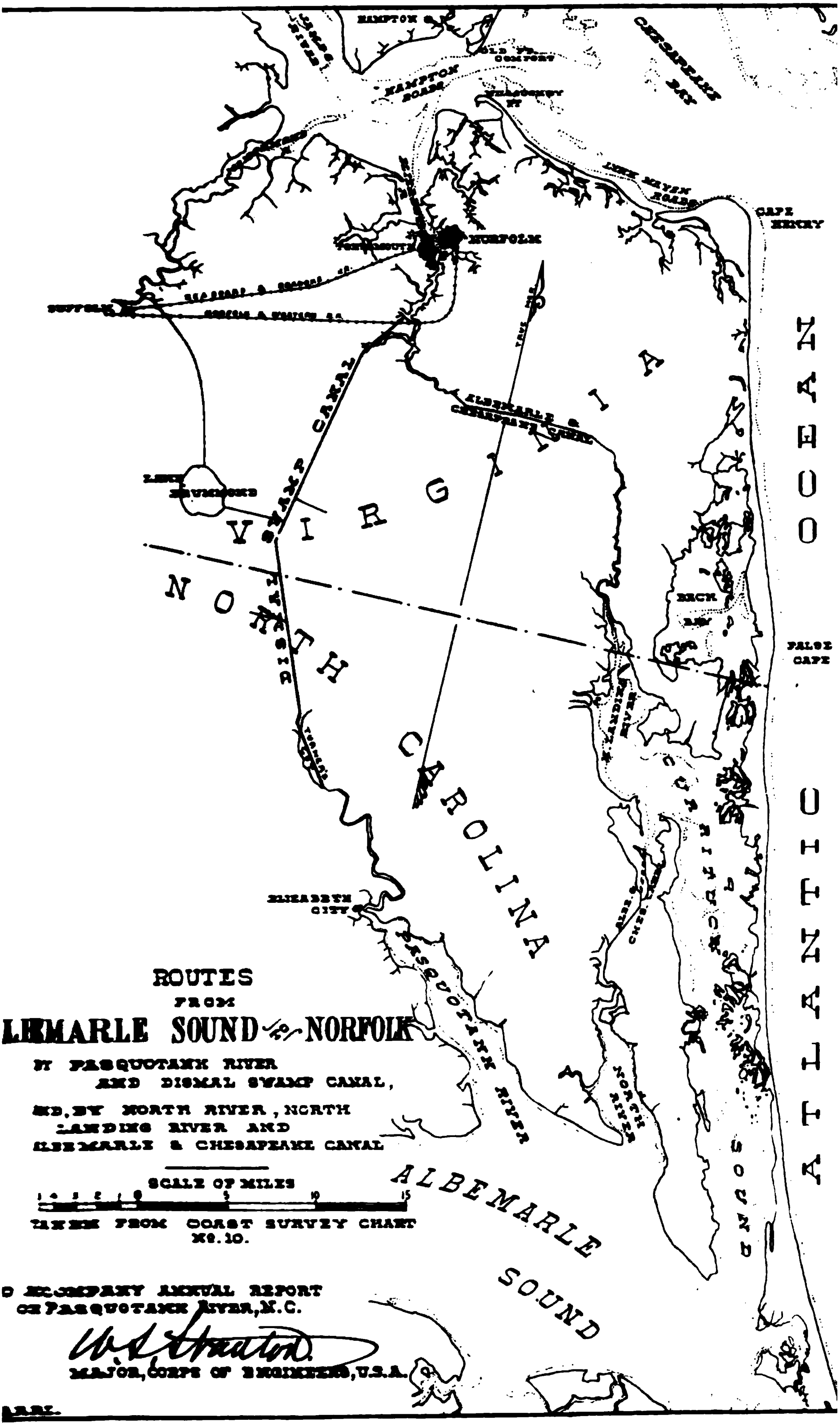
The canal, including Turners Cut, is 29 miles long, was constructed with a surface width of 30 feet and depth of 5½ feet, was widened for considerable distances to 40 and 60 feet, and has shoaled so that not more than about 3 feet can now be carried through it.

In 1892 it was purchased by the Lake Drummond Canal and Water Company, of Baltimore, with the intention, its president states, of increasing its width to 60 feet and its depth to 9 feet, and of reducing the number and increasing the dimensions of its locks.

Eastern North Carolina contains very extensive pine forests interspersed with swamps abounding with cypress. For the lumber from these forests, and especially for the short-leaf pine, embracing fully 90 per cent of the pine lumber in the region of the sounds, there is a great and increasing demand in Northern markets in consequence of the depletion and high price of Northern white pine. Of about 80,000,000 feet of lumber cut annually in the region of the sounds about 20,000,000 feet go north by rail and about 60,000,000 feet by the Albemarle and Chesapeake Canal route and by Ocracoke Inlet. These two latter routes are the only available outlets by water from Pamlico and Albemarle sounds, and their inadequate depth much hampers the transit of lumber north from the forests bordering the sounds. A draft of not more than 7 feet can ordinarily be carried through the Albemarle and Chesapeake Canal route, and northerly winds reduce it to less than 6 feet, while not more than 7 feet can be carried over the shoals immediately within Ocracoke Inlet.

An effort to permanently increase the channel depth on these latter shoals was, sixty years ago, persevered in by the Government for ten years at a cost of $133,000, without success. Were another effort to be successful navigation between the inlet and Northern ports would be subject to the baffling winds and currents and the perils of Cape Hatteras (29 miles east-northeast from the inlet), entailing long delays and high rates of insurance.

Barges are the cheapest means of transporting lumber and other heavy and bulky freight, and their use is increasing. With a draft of 8½ feet a barge can carry 350,000 feet of lumber and a towboat can tow four or five of them, taking about 1,500,000 feet at a trip. Were the Dismal Swamp Canal route deepened to 9 feet and enlarged as proposed by the present owners, great quantities of lumber from the North Carolina sounds would obtain direct and cheap transportation, safe at all times without insurance, to Norfolk, Washington, Baltimore, Philadelphia, and New York. About 50,000 bales of cotton annually are now shipped north by water (exclusively by the Albemarle and Chesapeake Canal route) from Newbern and Washington, N. C., and the improved canal route would promote useful competition with the railroads in the transport of cotton and also of vegetables and truck from Newbern and Elizabeth City, active and growing centers in the latter trade. Freight by water from Elizabeth City now goes southerly 17 miles down



ROUTES
FROM
LBEMARLE SOUND to NORFOLK
BY PASQUOTANK RIVER
AND DISMAL SWAMP CANAL,
ND, BY NORTH RIVER, NORTH
LANDING RIVER AND
LBEMARLE & CHESAPEAKE CANAL

SCALE OF MILES
1 4 3 2 1 0 5 10 15
TAKEN FROM COAST SURVEY CHART
No. 10.

O ACCOMPANY ANNUAL REPORT
ON PASQUOTANK RIVER, N.C.

MAJOR, CORPS OF ENGINEERS, U.S.A.

the Pasquotank to the Sound and then northerly through the Albemarle and Chesapeake Canal route to Norfolk.

The route by the Pasquotank River and Dismal Swamp Canal, if deepened to 9 feet, would so greatly benefit eastern North Carolina, forming, moreover, a part of the interior coast-wise water route, it is believed to be worthy of any means which the General Government may deem it expedient to apply to its improvement.

For the maintenance of the present cleared channel up to the lower mouth of Turners Cut to the depth which can now be carried through the canal, $1,000 should be appropriated for application, if necessary, during the fiscal year ending June 30, 1895.

There is reported to be carried through the canal in a year about 30,000 tons by crafts of all kinds.

The river is in the collection district of Elizabeth City, N. C.

Money statement.

July 1, 1892, balance unexpended	$589.85
Amount appropriated by act approved July 13, 1892	3,000.00
	3,589.85
June 30, 1893, amount expended during fiscal year	2,081.02
July 1, 1893, balance unexpended	1,508.83
July 1, 1893, outstanding liabilities	6.00
July 1, 1893, balance available	1,502.83
Amount (estimated) required for completion of existing project (maintenance)	1,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	1,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

Pasquotank River, North Carolina.

Appropriated—	
March 2, 1829	$80.00
September 19, 1890	3,000.00
July 13, 1892	3,000.00
Expended fiscal year ending—	
June 30, 1829	*47.25
June 30, 1891	2,340.28
June 30, 1892	75.87

L 4.

IMPROVEMENT OF MACKEYS CREEK, NORTH CAROLINA.

At the commencement of the fiscal year work was in progress under the contract entered into with the Alabama Dredging and Jetty Company, April 7, 1891, to dredge in accordance with the project of 1889 a channel 9 feet deep, 100 feet wide, and 2,100 feet long through the shoal in Albemarle Sound at the mouth of the creek, at a cost estimated at $15,000. To facilitate the towing by tugs of flatboats alongside, the width of the cut was increased to 140 feet.

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* Balance of $32.75 turned over to surplus fund.

July 12, 1892, the contract and the execution of the project were completed, when a channel 2,200 feet long, 140 feet wide, and 9 feet deep had been dredged through the shoal.

During the fiscal year ending June 30, 1893, 5,851 cubic yards of sand were removed, making, with the 41,359 cubic yards removed during the preceding fiscal year, a total of 47,210 cubic yards that were dredged by the contractors in execution of the project, at a cost of 26 cents per cubic yard, amounting to $12,274.60.

A schooner laden with shingles and staves, which is said to have been wrecked in 1820, was uncovered by the dredging and was removed by hired labor and by the United States hoister *Roanoke* from the Roanoke River.

This creek, down which cars loaded with lumber are towed from the railroad terminus on the creek across Albemarle Sound to the Norfolk and Southern Railroad at Edenton, is described on page 1113 of the Annual Report of the Chief of Engineers for 1892.

From a survey made by Mr. S. F. Burbank in June, 1893, it appears that there has been no shoaling in this channel since dredging ceased eleven months ago.

The creek is in the collection district of Edenton, N. C.

Money statement.

July 1, 1892, balance unexpended	$6,992.0
June 30, 1893, amount expended during fiscal year	6,388.5
July 1, 1893, balance unexpended	603.5
July 1, 1893, outstanding liabilities	104.5
July 1, 1893, balance available	498.9

COMMERCIAL STATISTICS.

The commerce for the year ending December 31, 1892, is estimated as follows:

Class of goods.	Tons.	Class of goods.	Tons.
Cotton	254	Fish and shell fish	
Cotton seed, meal, and oil	25	Lumber and its products	25,
Rice	7	General merchandise	2,
Grains	28		
Vegetables, including truck	1,730	Total	30,
Livestock, including poultry	39		

Decrease since last year, 3,699 tons; transportation lines established during year, none.

Freight transported.

Calendar year ending December 31—

	Tons
1890	32,4
1891	33,9

Mackeys Creek, North Carolina.

Appropriated September 19, 1890	$15,000.
Expended to June 30—	
1891	359.
1892	12,061.

L 5.

IMPROVEMENT OF OCRACOKE INLET, NORTH CAROLINA.

This inlet is 29 miles WSW. from Cape Hatteras, and is the deepest and most practicable of the four inlets, Ocracoke, Hatteras, New, and Oregon, from the ocean to Pamlico Sound.

The channel depth at mean low water is 14 feet on the bar approaching the inlet from the ocean, 32 feet in the throat of the inlet, and 7 feet on the shoals immediately within the inlet in the sound.

The purpose of the improvement is to obtain and maintain through these inner shoals a channel giving vessels unobstructed access between the ocean and the ports on Pamlico and Albemarle sounds and their affluent rivers, with as deep a draft as they can carry from Pamlico Sound into those ports now or after the completion of such improvements in those ports or their approaches as are probable.

During the fiscal year ending June 30, 1893, work has embraced only a supplemental survey of the inner shoals made in September and October, 1892. The soundings and borings were all taken, but the failure of the direction current meters (of special utility for observations so far from shore) and the close of the season favorable for such work made it expedient to postpone the necessary current observations until this summer, and they will be resumed in July.

The results of the survey, so far as manifest with the important omission of the current observations; the experience in a former prolonged and somewhat costly attempt to improve the channel on the inner shoals revealed by a careful examination of the official records of that work; the present project with its status, and the present and future requirements of the situation, are stated in the following reports with the charts that accompany them:

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., May 15, 1893.

GENERAL: The project of 1889 for the improvement of Ocracoke Inlet, North Carolina, is to dredge a channel 300 feet wide through the inner shoals at a cost estimated in 1889, if 10 feet deep, at $100,000; if 13 feet deep, at $190,000; or if 15 feet deep, at $280,000; and to protect the channel so dredged by such training walls or protecting dikes as may possibly prove necessary, at an additional cost estimated, in 1889, at $320,000.

The act of September 19, 1890, appropriated $90,000 for the improvement.

August 13, 1891, the Secretary of War approved a project to apply $83,000 to dredging "a first cut of at least 200 feet width and 12 feet depth at low water," and to apply any remaining funds in "widening and deepening" this cut.

November 28, 1891, a contract was entered into by the officer then in charge for dredging, to the extent of about $75,000 at 17 cents per cubic yard, measured in scows, a channel 12 feet deep at low water in the line of Wallace Channel. The contract has been extended three times and dredging has not yet commenced.

While the project, approved by the Secretary of War August 13, 1891, for the expenditure of the $90,000 appropriated September 19, 1890, authorized the depth of 12 feet prescribed in the contract, and sanctions further deepening, it is nowhere prescribed in the correspondence which (if either) of two depths, 13 and 15 feet mentioned in the original project and estimate, is ultimately to be attained.

April 1, 1892, Col. Craighill recommended and April 2, 1892, you directed that I submit "a special report on this subject, with estimates of the cost of obtaining and maintaining depths of 10, 12, and 14 or 15 feet at low water through the inner shoals," with my views as to the present and prospective requirements of the situation, taking into account the ruling depths of the rivers whose commerce would probably be affected by the improvement proposed and the navigation in and through Pamlico Sound.

In May, 1892, 130 circulars were sent to shipping agents, masters of vessels, and pilots on the seaboard from Maine to Savannah to obtain from them information as

to the utility to coastwise navigation of Ocracoke Inlet and the proposed improvement, especially as in the report (p. 1120, Annual Report Chief of Engineers, 1889) embodying the original project, importance is attached to the improvement as affording coasting vessels access through the inlet to Royal Shoal Harbor, in Pamlico Sound, as a refuge from the noted perils of Cape Hatteras and vicinity.

Finding, in the published appropriations and expenditures by the United States for rivers and harbors from 1789 to 1882, that the sum of $133,732.40 was expended for the improvement of Ocracoke Inlet from 1826 to 1837, the reports and correspondence, embracing 100 type-written pages, descriptive of the operations of those years were obtained and copied from the files in the office of the Chief of Engineers.

The project of 1827, by Capt. Hartman Bache, Topographical Engineers, was to dredge Flounder Slue to the depth of 10 feet and width of 400 feet, entailing the removal of 140,864 cubic yards, and thus obtain, with Wallace Channel, from the slue to the inlet, and with that part of the ship channel from the slue westerly to the sound, a continuous channel 10 feet in depth from the inlet through the inner shoals, to the sound. At that time the alternative was considered of adopting the ship channel entire and of dredging the two shoals, namely, the "Swash" and the "Bulkhead," that obstructed its easterly part, instead of dredging Flounder Slue. (See Chart of 1830). But Flounder Slue was adopted for reasons stated in the reports, as follows: Its direction was more favorable with regard to the prevailing winds; it afforded the nearer and more direct communication with the sea; it was protected by the islands to the northeast; unlike the "Swash" and the "Bulkhead," it was without cross currents; it had previously been the best channel until "destroyed by abuses in the navigation," consisting in the formation of numerous knolls and irregularities by grounding vessels in it and kedging them through it and in dumping ballast in it. (Report of Capt. Hartman Bache, 1827.)

When, in August, 1830, dredging was commenced at Flounder Slue "it was not considered practicable for more than 5 feet; in 1835 its depth had been increased to 8¼ feet at low water on the shoalest part for an average width of 120 feet," and it had "for a year previous become the principal channel for vessels from Pamlico and Neuse rivers."

In 1831 shoaling was observed at the mouth of Wallace Channel, and Beacon Island Slough was adopted instead of that part of Wallace Channel east of their junction. In 1835 Lieut. Swift reported that the mouth of Wallace Channel had become much shoaler but that vessels drawing 8 feet still passed out at high water, and that about the year 1818 it had been in a worse condition. In 1837 he reported that its mouth had become so shoal as to prevent its being used, and that where twelve months before there was 8 feet of water there was then (October, 1837) not more than 4. This part of Wallace Channel is now shown as a blind channel on Lieut. Lucas's map.

In 1831 Lieut. Dutton reported that the depth of water on the bulkhead in Beacon Island Slough was 6 feet at flood tide; and in 1832 he reported that by six weeks' dredging in August and September of that year it had been increased to a depth varying from 8¼ to 9 feet at flood tide and a width of 50 yards, so that vessels of the draft of water usually employed in that navigation could readily pass through the slough.

In his report for 1832 Lieut. Dutton remarked: "The most favorable circumstance attending the operations is the apparent permanency of the work already executed, contradicting in this essential point the opinions generally entertained, and affording the surest guaranty of the eventual success of the work."

November 23, 1833, it was reported "that from Wallace Channel" (doubtless at Beacon Island Slough) "about 34,000 yards of earth had been removed within a year," and that navigation of 8 feet had been obtained "through it."

November 1, 1834, in transmitting to Congress the whole report of the officer charged with the improvement, it was stated that "operations had been continued with perseverance; that 35,300 yards of earth had been excavated; that though the operations had been but partially successful they had nevertheless been productive of a decided and useful improvement in the navigation; 'that there were circumstances, however, arising out of the peculiar nature of the locality which, according to the experience of the last season, are such as to create strong doubts of the practicability of improving this navigation to the extent desired by those interested in its improvement, the principal object having been to obtain a draft of 10 feet at high tide.'" It was there further said: "'The causes here alluded to are the uncertain and shifting character of the shoals lying near the inlet.' The effect produced at some of the channels, the disappearance of much of the work, and the reappearance of some of the bars are described and the inference drawn that the permanent improvement by dredging for a greater depth of water than that then existing in Wallace Channel was uncertain, if not impracticable."

In his report of September 30, 1835, Lieut. Alexander J. Swift said: "To turn the course of the ebb tide in Wallace Chanel by means of a jetty over the strip of shoal separating this channel from Beacon Island Slough and the roads is the course which I propose in order to form a good mouth," his jetty being designed to accom-

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In his report of September 30, 1835, Lieut. Alexander J. Swift said: "To turn the course of the ebb tide in Wallace Chanel by means of a jetty over the strip of shoal separating this channel from Beacon Island Slough and the roads is the course which I propose in order to form a good mouth," his jetty being designed to accom-

push what it had been the endeavor to accomplish by dredging in Beacon Island Swash.

October 30, 1837, Lieut. Swift reported: "This jetty was commenced in the latter part of last March and was very nearly completed when the gale of the 18th and 19th of August very materially injured it. Such was the extent of the injury that it was thought inexpedient to prosecute the work. * * * The changes which are continually taking place in the navigation of Ocracoke Inlet may at some future time present an opportunity of permanently improving it at but little expense, but such is its exposed situation that I *now* regard the possibility of any *immediate* improvement as very doubtful, and therefore respectfully recommend to the Department a cessation for the present of the operations there."

There is no record of further operations, and such is the result of the expenditure by the Government of $133,732.40 for the improvement of Ocracoke Inlet from 1826 to 1837.

Briefly to recapitulate it: After a very careful selection of the channel to be made dredging commenced in 1830; in 1832 the engineer, Lieut. Dutton, considered the two years' experience as "affording the surest guarantee of the eventual success of the work;" after another two years, in 1834, the engineer stated that the experience of the last season was such as to create strong doubts of the practicability of improving "this navigation to obtain a draft of 10 feet at high tide;" finally, after a further experience of three years, and a total experience of seven years from the commencement of dredging, "the possibility of any immediate improvement" was regarded "as very doubtful," and the work ceased.

Among the responses to the circulars issued in May were some from mariners long familiar with the inner shoals, very positively asserting that while the material to be dredged in extending Wallace Channel is sand so shifting as to threaten the speedy closing of any channel dredged through it, and the depth of water only about 4 feet, at Ocracoke Swash, which had not changed for fifty years, the bottom was stiff mud, with a least channel depth of 7½ feet, and that to obtain the requisite draft of water from the inlet through the inner shoals to the sound, the channel to be dredged at the Swash would be only about one-fourth as long as that to be dredged at Wallace Channel.

It is understood that the survey made in February, March, and April, 1891, and upon which the present project was based, did not embrace Ocracoke Swash, for the reason that Teachs Hole Channel, through which vessels must pass to navigate the Swash Channel, had been several times choked up with sand at its mouth near the point of Ocracoke Island. However, as Ocracoke Swash is the only channel now and for several years past navigated by vessels crossing the inner shoals, and through which they can draw 7½ feet, in view of all the foregoing it was deemed by me expedient to extend the survey to embrace it for careful comparison with Wallace Channel before commencing work upon the improvement of the latter.

Such further survey was authorized by letter from your office of July 23, 1892, and was made in September and October by my assistant, First Lieut. E. W. Van C. Lucas, Corps of Engineers, whose report of February 18, 1893, with plot in three sheets, is herewith transmitted. Lieut. Lucas took upwards of 16,000 soundings, extending not only over Ocracoke Swash but over the area of the proposed dredging in Wallace Channel, for the purpose of a more accurate estimate of the quantities of dredging necessary to obtain the depths of 10, 12, 14, and 15 feet than could be made from the smaller number of soundings taken during the unfavorable conditions of weather and sea in March and April, 1891.

Lieut. Lucas finds that to obtain a depth of 12 feet through the Ocracoke Swash Channel will require dredging through five shoals an aggregate length of 17,600 feet and the excavation of 480,800 cubic yards, while to obtain 12 feet through Wallace Channel the length of dredging would aggregate 9,500 feet through two shoals and the amount of excavation would be 422,577 cubic yards. To obtain a depth of 10 feet from inlet to sound requires by Ocracoke Swash Channel dredging through three shoals a total length of 9,100 feet and the excavation of 162,265 cubic yards, and by Wallace Channel dredging through two shoals a total distance of 6,885 feet and the excavation of 232,487 cubic yards. Allowing an average of 6 inches excess of depth in dredging, the amount of excavation would be in Ocracoke Swash Channel 212,265 cubic yards and in Wallace Channel 271,565 cubic yards, a difference of 59,300 cubic yards (measured in situ) in favor of the Ocracoke Swash route, amounting, at the present contract price, 17 cents per cubic yard, measured in scow (equivalent to 21¼ cents per yard in situ, assuming an increase of 20 per cent in the scow), to $12,601.25.

Lieut. Lucas found by boring to the depth of 12 feet below low water that the material at the Swash is not stiff mud but a very fine sand, with a slight admixture of mud, and differing only by this admixture from the fine sand in Wallace Channel. Furthermore, a strong current at both ebb and flood sets across the channel that would be dredged at the Swash, an objection not found in Wallace Channel.

The route across the inner shoals, by the Ocracoke Swash Channel now used, lies from the inlet immediately through Teachs Hole, which curves sharply around the point of Ocracoke Island, making an angle of about 110° with the channel from the bar. A wind favorable for outward-bound vessels in Teachs Hole is unfavorable for northerly bound vessels outside the inlet, and the larger number of vessels sailing from it are bound to northern ports. On the other hand, a favorable wind for vessels outward bound through Wallace Channel is more favorable for vessels northerly bound at sea.

At the entrance to Teachs Hole Channel from the bar or inlet channel, where there is now a depth of 9.3 feet at low water, the surveys show a depth of 7 feet in 1830 and 5½ feet in 1852, and it is reported by mariners that since the latter date the entrance has become two or three times shoaled to 6 feet or less.

On the other hand, in Wallace Channel, measuring from a fixed line drawn southeasterly through Ocracoke Light-house, the 10-foot contour, although it receded towards the inlet one-half mile in the twenty-seven years from 1830 to 1857, advanced into the shoals five-eighths of a mile in the twenty years from 1857 to 1877, and five-eighths of a mile in the fifteen years from 1877 to 1892. Its net advance into the shoals since 1830 is three-quarters of a mile.

In 1827 the estimated amount of excavation to obtain a channel 400 feet wide and 10 feet deep from Wallace Channel through Flounder Slough and the swash of the Old Ship Channel to the sound was "5,401,933 cubic feet,"=200,071 cubic yards. Reducing this one-fourth for a channel 300 feet wide, it would have been 150,000 cubic yards. In that estimate of 1827 the depth of 10 feet is stated to be "at the average high water, which is 1 foot 4 inches greater than the tide to which the soundings on the map are reduced." The tidal observations by Lieut. Patrick in 1891 showed a range of tides of 0.6 of a foot at Flounder Slough Rock and of 0.4 of a foot at the head of Wallace Channel. The depth of 10 feet at high water in the estimate of 1827 is approximately 9 feet at low water now, and Lieut. Lucas estimates the amount of excavation necessary to now obtain a channel 300 feet wide and 9 feet deep at low water from the head of Wallace Channel to the sound to be 155,351 cubic yards, differing by only about 5,000 cubic yards from the quantity of excavation necessary in 1827, notwithstanding that Wallace Channel has since advanced three-quarters of a mile.

During the same time the Old Ship Channel, parallel to Wallace Channel, has shoaled at its swash (at its junction with Flounder Slough) 3½ feet (from 7 feet to 3½ feet), at its "bulkhead," 3 miles farther east, 5 feet (from 8 feet to 3 feet), and between those points about 6 feet (from 18 feet to 12 feet).

Now, as in 1831-'37, Beacon Island Slough is the other of the two localities needing improvement on this Wallace Channel route across the shoals. When dredging in this slough commenced in 1831, the least depth in its channel was 6 feet "at flood tide;" it was then increased by six weeks' dredging to "8½ to 9 feet" *at flood tide* for a width of 50 yards; its least depth is now 7½ feet *at low water* for a width of 300 feet. then its least width between its 6-foot contours was 330 feet, now it is 850 feet. While the channel through this slough has held its depth and greatly increased in width since 1837, it has (as nearly as can be ascertained from the charts), while retaining its direction, moved about 2,000 feet southerly and into an almost direct alignment with the channel immediately within the bar, and with the most favorable point of embouchure for the channel to be dredged into the sound. This increase in the capacity and improvement in the alignment of the channel through Beacon Island Slough, and the change in the location and direction of the line entailing least excavation (from Flounder Slough in 1837 to the prolongation of Wallace Channel now), by which this entire channel, when improved, will lie very closely on one course (NW. by W. ¾ W.) from the inlet to the sound, constitute its improvement in the fifty-six years since 1837.

Its direction is much more favorable than that of the Ocracoke Swash and Teachs Hole Channel for a vessel to sail from the sound to the inlet in a wind that would enable her to continue from the inlet around Cape Hatteras. Its selection by officers who examined the inner shoals sixty-six years ago, its history since, and its present condition confirm its selection in 1889 as the best channel for improvement to the depth of 9 or 10 feet.

By Lieut. Lucas's survey and estimate, the following are the quantities in situ to be excavated, and cost, at 21½ cents per cubic yard in situ, to dredge at the head of Wallace Channel and in Beacon Island Slough channels 300 feet wide to the respective depths of 9, 10, 12, 14, and 15 feet and thus obtain a continuous channel of not less than these depths from the inlet to the sound:

	Depth.				
	9 feet.	10 feet.	12 feet.	14 feet.	15 feet.
Beacon Island Slough .....cubic yards..	9,862	26,159	90,486	177,136	225,571
Head of Wallace Channel ....do....	183,207	245,407	386,486	562,962	706,980
Total ....do....	193,069	271,566	476,972	740,098	932,551
Cost, at 21¼ cents per cubic yard	$41,027.16	$57,707.78	$101,356.55	$157,270.83	$198,167.09
Add for contingencies..................	10 per cent.	10 per cent.	5 per cent.	5 per cent.	5 per cent.
Total estimated cost	$45,129.88	$63,478.56	$106,424.38	$165,134.37	$208,075.44

Assuming 4 yards in situ to make 5 yards in the scow, the foregoing price, 21¼ cents per yard in situ, is the same as the present contract price, 17 cents per cubic yard measured in scows, for dredging to the depth of 12 feet and amount of $75,000 at Ocracoke. The prices in the four other bids received September 5, 1891, were 30, 31, 34, and 41 cents per cubic yard measured in scows. It is not probable that as low a price as 17 cents can be obtained in another contract.

The only ports within Ocracoke Inlet to or from which vessels crossing the inner shoals would be bound are Newbern on the Neuse River, Washington on the Pamlico River, Elizabeth City on the Pasquotank River, Edenton on Albemarle Sound, four points on the Roanoke River (Plymouth, Jamesville, Williamston, and Hamilton), and a number of points on Pamlico Sound where lumber is shipped directly from the mills.

The greatest depth that vessels can now rely upon carrying up the Neuse River to Newbern and up the Pamlico to Washington is 8 feet.

As very roughly estimated, merely from the Coast Survey charts, to obtain depths of 10, 13, or 15 feet up to Newbern would require dredging in the Neuse River the respective lengths of about 1.3, 3, and 11.4 miles, involving the excavation, respectively, of about 100,000, 350,000, and 1,165,000 cubic yards, at the respective costs of about $15,000, $50,000, and $170,000; and to obtain the same depths up to Washington would require dredging in the Pamlico River the lengths, respectively, of about 5.2, 9.8, and 14 miles, entailing the excavation, respectively, of about 553,000, 1,790,000, and 3,110,000 cubic yards, at the estimated respective costs of about $80,000, $265,000, and $450,000. The foregoing estimates are for a channel 200 feet wide, dredging at 13½ cents per cubic yard, and might be very materially increased by accurate surveys, and are very liable to still larger increase if stumps be encountered, which have been found in dredging hitherto in both rivers.

The greatest draft which can now be carried from any point on the sounds whence lumber is shipped direct is 8½ feet.

The other ports above named on the Pasquotank and Roanoke rivers and Albemarle Sound could be reached from Wallace Channel at Ocracoke Inlet only by first crossing Bluff Shoal in Pamlico Sound and thence passing through Croatan Sound into Albemarle Sound. The Bluff Shoal is 1 mile across, and only 11 feet can be carried over it. Ordinarily in a calm a draft of 8 feet only can be carried through Croatan Sound. A northerly wind blowing the water from Croatan Sound into Pamlico Sound reduces this draft to about 7 feet, while inversely a southerly wind increases it to about 9 feet.

A depth of 9 feet through the inner shoals at Ocracoke Inlet, permitting vessels to draw with safety 8 to 8½ feet, is the greatest depth that would at present be of any utility to vessels engaged in the commerce of Pamlico and Albemarle sounds and their affluents, and 10 feet is as great a depth as it is even remotely probable will be required for that commerce in the future.

The present contract (of November 28, 1891) is for dredging to 12 feet in prosecution (so far as funds available permit) of the project approved by the Secretary of War August 13, 1891, authorizing further deepening, and of the original project of 1889, which embraces estimates for depths of 10, 13, and 15 feet, the latter being the greatest depth at mean low water on the outer bar when it is in exceptionally favorable condition. As any greater depth than 10 feet will be at present and in future superfluous for vessels navigating the sounds, the purpose in obtaining through the inner shoals the greater depths up to 15 feet can be only to permit coastwise vessels to cross the inner shoals for refuge in the sound, as mentioned in the report accompanying the project of 1889. (Annual Report Chief of Engineers, 1889, p. 1120, before cited.)

I have diligently sought, by circulars and otherwise, information upon the utility of the proposed improvement for this purpose, and have obtained it from a considerable number of agents, shipowners, and mariners familiar with the navigation of the sounds and of that noted part of the coast embracing Capes Lookout and

Hatteras. The greatest depth that can be relied upon on the outer bar at Ocracoke Inlet is 14 feet at low water and 18 feet at high water. At least a great many, if not the larger number, of the vessels now engaged in the coastwise trade draw not less than 14 feet. Frequently at least, if not usually, when vessels are seeking a harbor of refuge there is considerable sea, and a good margin between the depth on the bar and the draft of the vessel is necessary, especially on so exposed a bar on so rough a part of the coast as the vicinity of Hatteras, when a harbor of refuge would be most sought in easterly storms. Mariners are very careful not to become embayed in the bight between Capes Hatteras and Lookout, for, if unable to round either cape, and if unable to enter either Ocracoke or Hatteras inlet from too much draft, thick weather, or want of knowledge of the bar channel when too rough to be boarded by a pilot, they must go ashore. In the sailing directions in the Atlantic Coast Pilot it is said: "Strangers should not attempt to enter this inlet without a pilot, as it changes so frequently that no reliable directions can be given." Therefore coasting vessels only of the lighter drafts will seek Ocracoke for refuge; and it is not at all probable that they would cross the inner shoals for an anchorage were a deeper channel cut through the inner shoals, because, first, there is plenty of room and good and at least fairly sheltered anchorage close within the inlet, and, second, if anchored in the sound they would be handicapped in getting to sea again by having to be towed, or to wait for a favorable wind to sail, through the 5 miles of narrow channel.

The area at the northwesterly verge of the inner shoals at the light-house and nearly inclosed by Royal Shoal (see Coast Survey chart) will have its value as an anchorage for vessels navigating the sound to and from the inlet considerably enhanced by the proposed improvement of Wallace Channel; but in my opinion there is no probability that coastwise vessels not bound to the North Carolina sounds would ever resort to it for refuge. The usefulness of the improvement to coastwise vessels not bound to the ports of these sounds will be restricted to permitting an occasional disabled vessel of the lighter drafts to get access to the marine railways and shipyards at Newbern and Washington.

From the foregoing, it is my opinion, formed after careful and quite extended inquiry, that any dredging on the inner shoals at Ocracoke would be superfluous; that is, in excess of 10 feet, the depth prescribed in the project of 1827 and worked for until 1837.

If the depth of dredging under the present contract, which prescribes 12 feet, can be restricted to 10 feet, the amount of that contract ($75,000) will be sufficient to complete the dredging 300 feet in width through both shoals at Beacon Island Slough and the head of Wallace Channel.

The following facts seem to me to have an important relation to present and future requirements at Ocracoke Inlet.

The rivers Neuse and Tar, so far as they lie in the territory where cotton is produced in considerable quantity, are shallow, and navigation upon them, even by light-draft boats, intermittent and uncertain, sometimes beginning (after the low-water season of the summer and autumn) soon after the shipping of the cotton crop commences and sometimes not until it is far advanced.

Since 1879, $254,000 have been spent on the Neuse, a great part of it between Kinston and Newbern, and since 1880, $48,000 have been spent on the Tar River between Tarboro and Washington. No boats now run at any season of the year from Kinston to Newbern, and on the Tar River from Tarboro to Washington, where 4 steamers were running seven or eight years ago, only 2 now run when the stage of water permits, and I am informed it barely pays to run them from Washington more than two-thirds of the distance to Tarboro.

The route from the cotton belt of the State to Norfolk by two separate railway lines is very direct and much shorter than by water, and shipment by rail involves no cost for insurance. From Tarboro, in the easterly part of the cotton belt, the distance to Norfolk is by rail 102 miles and by water (river, sounds, and canal) 29 miles.

Of about 350,000 bales of cotton produced annually in North Carolina, about 50,000 bales are shipped from Newbern and Washington by the sounds and canal to Norfolk, and none by Ocracoke Inlet, over whose inner shoals as much water (7 feet) can now be drawn as through the canal.

Naval stores were formerly produced and shipped in large quantities from all along the coast of North Carolina, but owing to the exhaustion of the long-leafed pine their production has now practically ceased north of the district whose outlet is Wilmington.

Of the eight counties of North Carolina, namely, Dare, Tyrrell, Washington, Hyde, Beaufort, Pamlico, Craven, and Carteret, lying contiguous to and between Albemarle and Pamlico sounds, the Pamlico and Lower Neuse rivers, and embracing an area of 4,370 square miles, the area under cultivation for cotton, tobacco, and the cereals was in 1889, by the United States Census of 1890, by counties, less than 1 to 10 per east, and averaged about 5 per cent of their whole area. In the three counties next west (Martin, Pitt, and Jones), embracing 1,770 square miles, the area under like cultivation varied, by counties, from 12 to 18, and averaged about 14 per cent of their entire area.

The above-named eleven counties contain very extensive tracts of pine timber with more or less cypress swamp. Eastern North Carolina is described in the encyclopædias as "A broad expanse of from 40 to 60 miles towards the interior of pine forests intersected by cypress morasses, embracing an area of 3,000,000 acres." The pine in these tracts north of the Neuse River is almost wholly the short-leafed variety. Replies to circulars sent to all the principal lumbermen in that region state that the short-leafed pine is almost inexhaustible, while the long-leafed variety, known in the North as the yellow pine, is nearly exhausted and rapidly becoming extinct.

The short-leafed pine grows rapidly, and, in areas which are cleared of both varieties of merchantable sizes, it both renews itself and replaces the long-leafed pine. Large numbers of hogs, always roaming in the woods, eagerly devour the seed of the long-leafed pine and burrow deep in the ground to eat the succulent roots of its young growth, while forest fires, from the crude turpentine adhering to the boxed trees, are more destructive of it. The short-leafed pine is not so preyed upon and is in great and increasing demand in the North for the interior finishing of houses in place of the high-priced and nearly exhausted Northern white pine, formerly used for that purpose.

Short-leafed pine lumber will constitute for many years the great volume of heavy and bulky freight requiring cheap transportation from the region accessible to Albemarle and Pamlico sounds and the rivers flowing into them, and it will practically all go North.

The lumber trade from North Carolina with the West Indies is wholly in long-leafed pine, is cut from the region south of the Neuse River and is shipped from Wilmington, which, of its annual output of about 26,000,000 feet of lumber, ships annually to the West Indies about 16,000,000 feet of long-leafed pine.

It is said that the trade in cypress shingles from North Carolina to the West Indies has much diminished, and continues to diminish, from the increasing use there of corrugated galvanized iron roofing. The annual shipment of shingles from Wilmington to the West Indies has fallen off from an average of 3,442,000 in 1888, 1889, and 1890, to an average of 2,098,000 in 1891 and 1892, a decrease of 39 per cent.

Citizens of Washington, N. C., have prompted and strenuously urge the improvement of Ocracoke Inlet to give that town direct communication with the sea, a line of steamers to the North, build it up as a seaport, and restore the large foreign commerce which they say it had before the war. With the movement of cotton and the condition of the lumber and shingle trade as above given, I am unable to find what the foreign trade from Washington would principally embrace, except the export of barrel staves and import of salt and molasses.

As very much the larger part of the freight that would go out of Ocracoke Inlet would be bound North, would emerge upon the coast 17 miles southerly from Cape Hatteras and would incur the dangers of the perilous shoals off the cape, crossed by strong and variable currents and the baffling winds of that locality, noted as being worse and more dreaded than any other part of the Atlantic coast of the United States, I have, in investigating this whole subject, been more and more impressed with the disadvantage of the outside route north, via Ocracoke, in contrast with the advantages of an interior route from the sounds by canal to Elizabeth River and Hampton Roads.

The prevailing winds on that part of the coast from September to April are northerly or northwesterly, and the course of vessels from Bodies Island, 35 miles north of Cape Hatteras, 76 miles to Cape Henry, is north-northwest. One mariner writes me "It is more trouble getting from Hatteras to Cape Henry in the winter time than from Cape Henry to Boston," on account of the different trend of the coast. The former distance is 76 miles while the latter is 540 miles.

From April to September the prevailing wind at Hatteras is southwest, causing a strong northerly current across Hatteras Shoals, both wind and current baffling vessels southward bound in their endeavors to round the cape, and if they get well off it they encounter the adverse current of the Gulf Stream. One mariner wrote me in July last that on a trip he was then making he had been three weeks trying to get round Hatteras, beating against a southwester, and counted 55 vessels around him likewise baffled. Another writes that he has known vessels detained off the shoals fifteen to twenty days, and cites an instance of a vessel bound to the Pamlico River which abandoned its attempt to round the cape after a persevering effort, sailed back to Hampton Roads, returned south through the Albemarle and Chesapeake Canal and the sounds to the Pamlico River, there received its cargo, and sailed out through the inlet, passing, as it rounded Cape Hatteras, the very vessels with which it had attempted to double the cape going south, still to the north of it waiting for a favorable wind. Another instance is given of two vessels arriving at the cape together, bound, the one through Hatteras Inlet, 11 miles south of the cape, and the other to Galveston, Tex. The latter reached Galveston while the former was still waiting to get around Hatteras and through the inlet.

Narrow-gauge railways are building, in gradually increasing numbers, into the extensive timber tract of extreme eastern North Carolina. Their first cost is about $1,500 to $2,000 per mile, and when trees of merchantable size are cut away within convenient reach the track is moved at a cost of about $500 per mile.

The quantity of lumber cut annually along the lower rivers and shores of the two sounds (Pamlico and Albemarle) and brought to them by the narrow-gauge railways and other means, for transportation north by water, is upwards of 60,000,000 feet, and in view of the great quantity and rapid growth of short-leafed pine accessible from the sounds, and of the increasing demand for it in the North, trade in it to the North is susceptible of great development if a cheap, direct, safe, and reliable all-water route can be provided for it; but it is now greatly hampered, not only by the shoals at Ocracoke, but by the difficulties of coastwise navigation at Hatteras and north to Cape Henry. To improve the Ocracoke outlet invites this trade more and more to incur those difficulties of the very part of the coast most dreaded by all coasters, and which it seeks to avoid by the interior route north through the Albemarle and Chesapeake Canal, but where it is again hampered by tolls (60 cents per 1,000 feet, with a rebate of 20 cents on every 2,000,000 feet) and by the want of capacity of that waterway which is tortuous and shallow, permitting, usually, but 7 feet draft and only 6 feet when north winds lower the water in Currituck Sound.

From Albemarle Sound 9½ feet can usually be carried through an excellent channel, with no current, up the Pasquotank River 29 miles to the Dismal Swamp Canal. This depth is diminished by strong northerly winds to 8 feet, but could be increased by a little dredging about 3 miles below Elizabeth City.

Barges with a draft not exceeding 8½ feet will carry each 350,000 feet of lumber, and a towboat will haul four or five of them, taking about 1,500,000 feet at a trip. This is the cheapest method of transporting lumber and other heavy and bulky freights.

It is understood that the larger barges can even go outside from Hampton Roads to Philadelphia and New York.

Were the Dismal Swamp Canal (now shoaled in places to the depth of about 3 feet enlarged and deepened to 9 feet, with a little increase in depth (now 8 feet) at intervals for a mile in Croatan Sound, lumber could go by this cheapest method of transportation without cost for insurance direct from the sounds of North Carolina to Norfolk, Baltimore, Washington, and Philadelphia. By this route there would be no expense for insurance, and delay would seldom be entailed, at least to Norfolk, by the weather. The insurance on lumber by sea from Ocracoke is 2½ per cent of its value, to which must be added pilot's fee, and perhaps towage, unless delay is to be incurred in waiting for a favorable wind to get through the channel 300 feet wide and a mile long.

All the foregoing facts and considerations, to say nothing of the possible difficulty of maintaining a channel dredged through the inner shoals, greatly depreciate, in my estimation, the importance of the improvement of Ocracoke Inlet, and impress me with the incomparably greater value of an enlargement of the Dismal Swamp Canal as a work of first importance and lasting benefit to the commercial interests of eastern North Carolina. Besides its use by barges with heavy and bulky freight the enlarged Dismal Swamp Canal would insure to steamers from the sounds (now hampered by the inadequacy of the Albemarle and Chesapeake Canal route) quick and reliable transit to Norfolk for passengers and for the increasing and perishable products of the oyster beds and fisheries and truck farms, for which Newbern is becoming a center of some importance.

The route by the Dismal Swamp Canal, if enlarged, would thus induce the most effective competition with the easterly lines of railroad north to Norfolk that can be obtained, and would be the shortest, most westerly, and most reliable of the obtainable water routes north from the Carolina sounds.

Its possible ultimate extension to Beaufort through Core Sound or the Clubfoot and Harlowe Canal would give an outlet for large quantities of lumber from the extensive timber tract lying to the north of Bogue Sound, and give to the lighter draft coasting vessels, now hardly able to compete with the larger vessels, the choice of an inside route from Hampton Roads to Beaufort, which they could probably pursue south in summer and north in winter with advantage in avoiding, at least in part, the conditions so baffling to vessels outside bound in those directions in those seasons.

An estimate is required of the cost of maintaining the channel to be dredged through the inner shoals.

The 10-foot contour in the shoals in the sounds, measured from a line drawn through Mount Vernon Rock and tangent to the end of Portsmouth Island at the inlet to a line drawn through Howards Reef and the point of Ocracoke Island, is miles long, closely following a curve lying pretty uniformly (excepting at Bluff Shoal) 6 miles distant from the throat of the inlet. Between this contour, the lines drawn as above, and the throat of the inlet the inner shoals embrace an area of 32½ square miles of exceedingly fine but not quite impalpable sand, shifting with currents often induced and controlled by the wind.

The mean range of tide is, on the bar 3 feet, at the anchorage 1½ feet (both by Coast Pilot), and at the head of Wallace Channel, 6 miles from the inlet, it is 4 inches, so great is the lateral expansion commencing immediately within the inlet.

The relative mean heights of the ocean and sound are not accurately known, but it is said (Annual Report, Chief of Engineers, 1889, p. 1121) that the sound is reported to average about 1 foot the higher. The sea being at mean low water below and at mean high water above the sound, the tide flows flood through the inlet from that time during the flood tide when the sea has risen to the sound level until during the ebb it has receded to that level again; during the remainder of the ebb tide, and during the flood tide until the level of sound and sea are the same, there is an ebb current running out through the inlet. The ebb current is the stronger. Reliable information regarding the currents and slope between the inlet and the head of Wallace Channel is desirable and should be obtained this season by further current observations and by ascertaining (with the level) the relative heights of the zeros of the several tide gauges, which the failure of the current meter, the distance of the stations from shore, and the weather towards the close of the survey prevented last season.

From the inlet the inner shoals are penetrated by four principal channels, Wallace, the Old Ship Channel, Blairs, and Teachs Hole Channel, all lying within the quadrant extending from northwest to northeast. The 6-foot contours of the extreme westerly channel, Wallace, of the extreme easterly one, Teachs Hole (in Big Foot Slue), and of Blairs next to the latter, end respectively at the channel lengths of 6, 5¾, and 5½ miles from the inlet. The Old Ship Channel, formerly navigated, has now become so deteriorated as to almost, or quite, lose its continuity as a channel. Teachs Hole Channel, and the Ocracoke Swash, to which it leads, form the route now used exclusively by vessels. The changes that have occurred in these four channels with the blind ones branching from them and sloughs connecting them will be found in much detail in Lieut. Lucas report.

The tidal forces acting through the inlet with the usually prevalent states of wind seem now to maintain the depth of 6 feet to a distance from the inlet of 6 miles in the straighter and of 5½ to 5¾ miles in the more circuitous channels. If Wallace Channel be extended to the sound by dredging to the depth of 10 feet the extension will be 1 mile in length, an increase in channel length from the inlet of 17½ per cent (from 5¾ miles to 6¾ miles), where there must be a much weakened current, while the embouchure of the channel in the sound will be exposed to the action of the waves, fortunately restricted in a material degree by the location of the embouchure in the basin or anchorage nearly inclosed by Royal Shoal, and known as Royal Shoal Harbor.

To obtain a depth of 10 feet the depth to be excavated at the crest of the shoal will be 5½ feet, making, for a width of 300 feet, the cross-section of excavation 1,650 square feet.

Wallace and the Old Ship channels are for a considerable distance approximately parallel and 3,000 to 4,000 feet apart. While extensive changes have occurred in them since 1827, the latter having diminished in depth in places as much as 3½, 5, and 6 feet, and the former having advanced three-quarters of a mile toward the sound, it has been seen that the quantities of excavation necessary to obtain a channel 300 feet wide and 9 feet deep to the sound from the Old Ship Channel in 1827, and from Wallace Channel now, differ only about 5,000 cubic yards in an excavation a mile long. This fact, together with the symmetry in the outline of the shoal, the near uniformity in the distance of the outline from the inlet, and in the channel lengths (considering the effect of sinuosities and of prevailing winds) to which the three principal channels extend from the inlet, suggest an adjustment of depths and distances on the shoals from the heads of the channels to the sound which the cutting of so large an artificial channel would disturb and which the natural forces would restore.

The sound, in the resistance which the water offers to a disturbance of the distribution, along the perimeter of the shoals, of the flow of water into it (an abnormally increased flow upon it at any one locality entailing there an increase of head) is, it seems to me, the conservator of the relative capacities of the several channels from the inlet to itself, preserving their adjustment and ceaselessly acting to restore it whenever disturbed by movements of sand in storms or by artificial causes.

Even if the natural forces normally in action were to adapt themselves to the maintenance of the artificial channel (more or less modified by them) gales exceptional in force and direction, or exceptional seasons (which do occur, although with more or less infrequency) when winds of more than ordinary force blow with unusual frequency or persistency for a considerable period from an unusual quarter, may in so broad an expanse of shoals of fine and shifting sand speedily choke up and destroy, for purposes of navigation, that or any existing channel, while opening another, after which the natural forces, acting under normal conditions, would adjust to those conditions the relative capacities of the channels that had been newly formed.

I therefore regard an attempt to make and maintain such an enlargement of any one of the channels on the inner shoals as hazardous in the extreme.

Training walls are contemplated in the project of 1889 as of utility and of possible necessity in maintaining the artificial channel.

If built up to low water, 5 feet wide on top, with natural slopes, and on brush mattresses, they are estimated to cost, with stone at $2 per ton, oyster rock at 20 cents per cubic yard, and mattresses at $1.05 per square yard:

For 5,680 feet of artificial channel if dredged to 10 feet, 11,360 linear feet of training wall, if all of stone	$192, 249. 20
Or, if built with a hearting of oyster rock	71, 895. 45
For 6,410 feet of artificial channel if dredged to 12 feet, 12,820 linear feet of training wall, if all of stone	219, 934. 34
Or, if built with a hearting of oyster rock	78, 762. 30

Oyster rock could be used with advantage for the hearting of the training walls provided it could be found elsewhere than along the margin of Wallace Channel, where it should not be disturbed.

For channels dredged to the depths of 14 feet and 15 feet training walls would aggregate, respectively, 15,760 linear feet and 19,280 linear feet, and entail much increase of cost.

The vessels now navigating the inlet suffer long delays in Teachs Hole and Ocracoke Swash channels, where the least depth is 7 feet. Those vessels could be saved much vexatious delay by increasing the depth in the Teachs Hole and Swash Channel to 8½ feet, as great as is now found in the channels leading to the ports on the sounds and lower rivers, at an estimated cost not to exceed $15,000, but a cross current at the swash will be liable to cause it to again shoal.

To recapitulate:

(1) An outlet by water from the sounds of North Carolina is greatly needed for the products of the easterly part of the State, and especially for the large and increasing output of lumber destined to continue for many years, almost all of which is northerly bound.

(2) The route by Ocracoke Inlet entails upon commerce all the perils and delays of Cape Hatteras, which it is ever the wish of mariners and others interested in coastwise navigation to avoid.

(3) The work of improving the inner shoals at the inlet was prosecuted for ten years at a cost of upwards of $133,000, and there is no reason for predicting that a renewal of the attempt now would be any more promising of permanent success than then.

(4) The route by the Dismal Swamp Canal is absolutely safe at all times and the shortest water route from the sounds to Hampton Roads. Through it a depth of 9 feet can be obtained by only enlarging 29 miles of canal, entailing no hazardous or doubtful features of engineering, and at a cost that can be closely estimated. It would provide for heavy freight an ample outlet by barge, the cheapest method of coastwise transportation.

(5) That route is so eligible, and its improvement is so much needed, it will very probably be effected, if not by the Government, by corporate instrumentality, and its adaption to barges of 8½ feet draft would very greatly detract from the even present importance of Ocracoke Inlet.

(6) At an estimated cost of $15,000, a depth of 8½ feet, as great as there is now in the channels leading to Washington or Newbern or from the inlet to any other port of the sounds, can be obtained on the Ocracoke Swash, the channel now used.

(7) If it be deemed expedient to obtain a greater depth from the inner shoals to answer any possible future demands of those ports, the attempt should be made at Wallace Channel and the depth to be obtained should not exceed 10 feet.

After careful and prolonged examination and mature consideration of this subject I would not recommend the expenditure of any money upon the improvement of the inner shoals, except, perhaps, $15,000 to obtain 8½ feet at Ocracoke Swash, which, during the time the increased depth might remain, would much relieve the vessels now navigating the inlet.

* * * * * * *

There are transmitted herewith the following six inclosures:

Nos, 1, 2, 3, and 4 being report of Lieut. Lucas, with blue prints of his charts Nos. 1, 2, and 3.

No. 5, blue print of the chart of 1830.
No. 6, blue print of the chart of 1835.

Respectfully submitted.

W. S. STANTON,
Major, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

Pursuant to instructions of June 14, 1893, from the Chief of Engineers, an agreement supplementary to the contract, providing for the termination of the latter by mutual consent, was prepared and sent to the contractors for the signature of themselves and bondsmen, but has not yet been returned.

Money statement.

July 1, 1892, balance unexpended		$87,869.72
Amount appropriated by act approved July 13, 1892		15,000.00
		102,869.72
June 30, 1893, amount expended during fiscal year		2,992.87
July 1, 1893, balance unexpended		99,876.85
July 1, 1893, outstanding liabilities	$5.00	
July 1, 1893, amount covered by uncompleted contracts	75,000.00	
		75,005.00
July 1, 1893, balance available		24,871.85
Amount (estimated) required for completion of existing project		495,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867.

REPORT OF LIEUT. E. W. VAN C. LUCAS, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., February 18, 1893.

MAJOR: I have the honor to submit the following report of my work at Ocracoke Inlet, North Carolina, from September 1 to November 3, 1892, together with three maps, a set of profiles of the bottom of Wallace Channel, and Appendixes A and B.

The maps are as follows:

Sheet 1, a plot of the entire survey to scale 2,000 feet to 1 inch.

Sheet 2, map of Beacon Island Slough, showing proposed cut, drawn to scale of 400 feet to 1 inch.

Sheet 3, map of Royal Shoal, east of Royal Shoal Harbor, showing proposed cut, drawn to scale of 400 feet to 1 inch.

Appendix A gives the estimates for dredging.

Appendix B consists of a discussion of the various conditions at Ocracoke affecting the proposed work.

In accordance with your letter of instructions from this office, dated August 22, 1892, I left Wilmington September 1, assembled my party at Beaufort, and reached Ocracoke September 4.

Actual work of the survey commenced September 5. Sounding work was completed October 15. Level and base line work were finished October 22. Current observations for velocity were made October 17 to November 2.

The instrument used for current observations was a Ritchie-Haskell direction current meter borrowed from the Savannah, Ga., United States Engineer Office, and one of the first of the kind ever made. After preliminary tests I found it out of order and sent it to Boston September 19 for repairs, receiving it again October 16. It then worked properly for a short time, but a pivot of compass box breaking off, the direction part was rendered useless for the time and my current observations were restricted mainly to obtaining velocities, although I took rough observations for current directions with a rudder arrangement and spirit compass.

For consideration in ascertaining the effect of wind on tidal currents I have obtained from the United States Signal Office at Washington, D. C., the data obtained from several years' wind observations at Hatteras, which is 18 miles from Ocracoke light, is the nearest Signal Service Station, and has generally similar weather conditions.

The results of my investigations in this direction will be submitted with my report of tidal observations to be made during the coming season.

Borings were made on Royal Shoal, Cockle Shoal and the "swash" west of the lower end of Big Foot Slough, and the samples obtained are herewith submitted.

Special care was taken to keep the field notes in a clear and intelligible way. They are contained in the following books: One triangulation book, 1 level book, 1 stadia book, 1 tide-gauge book, 8 transit books, 10 sounding books, and 2 books containing daily record of work.

In addition to myself, my party originally consisted of 1 assistant engineer, 1 surveyor, 1 overseer, 1 recorder, 1 engine driver for naphtha launch, 3 boatmen, and 1 cook. Gauge observers were employed as required.

September 19 I relieved Assistant Engineer W. H. Chadbourn from duty at Ocracoke, his further services being rendered unnecessary by suspension of current observations. For the same reason I sent the sharpie back to Beaufort September 23, the crew of 2 boatmen being discharged upon their arrival at that place.

Upon completion of sounding work, October 15, I relieved Overseer John A. Dill and, in accordance with your directions, ordered him to Georgetown, S. C. At the same time I discharged 1 boatman.

On October 26 I discharged Surveyor S. F. Burbank, his work having been completed.

In accordance with your orders I suspended work November 3 and left Ocracoke for Beaufort with the remainder of the party, which was there disbanded.

A measured base line 14,305 feet long was used, and all observation stations for locating soundings were located by triangulation work.

The triangulation stations at Haulover Point, Portsmouth Point, and Mount Vernon Rock are identical with those used by Lieut. Patrick in his survey at Ocracoke in 1891.

Shore lines were located by stadia work.

Soundings were located by simultaneous transit observations taken every minute from two triangulation stations. The signal for taking sight was a flag dropped from the flagstaff of sounding boat, but the sight was generally taken to top of sounding rod when in its upright position as sounding was taken.

The rod could be seen through transit telescope to a distance of about 3 miles. For greater distances sight was taken to man sounding.

Lines of soundings as taken are shown on maps herewith submitted.

About 16,250 soundings were taken over an area of about 20¼ square miles.

The cost of the survey was $1,384.28.

I am indebted to Surveyor S. F. Burbank, Overseer J. A. Dill, and Recorder F. R. Brown for their painstaking and efficient work, which contributed materially to the progress and accuracy of the survey.

Very respectfully, your obedient servant,

E. W. VAN C. LUCAS,
First Lieut. of Engineers.

Maj. W. S. STANTON,
Corps of Engineers, U. S. A.

APPENDIX A.

ESTIMATES.

Estimates for dredging, at the places indicated on maps submitted herewith, through Royal Shoal and Beacon Island Slue, to depths of 9, 10, 12, 14, and 15 feet at mean low water, are given below. Allowance is made for side slopes of 45°, and estimates give amount of material with no excess allowance, and with allowance of 1 foot excess in depth.

No excess allowance.

	9 feet.	10 feet.	12 feet.	14 feet.	15 feet.
	Cubic yards.	*Cubic yards.*	*Cubic yards.*	*Cubic yards.*	*Cubic yards.*
Royal Shoal	155, 351	214, 493	349, 498	522, 670	633, 7[illegible]
Beacon Island Slue	6, 054	17, 994	73, 079	154, 779	201, [illegible]
Total	161, 405	232, 487	422, 577	677, 449	835, 06[illegible]

Excess allowance of 1 foot.

	9 feet.	10 feet.	12 feet.	14 feet.	15 feet.
	Cubic yards.	*Cubic yards.*	*Cubic yards.*	*Cubic yards.*	*Cubic yards.*
Royal Shoal	211,062	276,320	423,473	603,253	780,177
Beacon Island Slue	13,670	34,324	107,893	199,494	249,863
Total	224,732	310,644	531,366	802,747	1,030,040

The difference made by allowing 1 foot for excess over 12 feet depth is 108,789 cubic yards, or 25.7 per cent.

To improve Teachs Hole route, at present in use, to a depth of 12 feet at mean low water would require dredging a total length of 17,600 feet, and the excavation of 480,800 cubic yards if no excess allowance is made, and 680,000 cubic yards with the excess allowance of 1 foot.

APPENDIX B.

PART 1.—POSSIBLE CHANNEL ROUTES.

Ocracoke Inlet, North Carolina, is about 1¾ miles wide and between Ocracoke and Portsmouth Points there is a practicable channel 1,200 feet wide between 12-foot curves with greatest depth of 40 to 45 feet.

Seaward from the inlet a bar extends about 2 miles and through this bar the deep ship channel passes in a southeast direction close to Ocracoke Point for about a mile, where it is divided into two smaller channels, the principal one of which runs east northeast to the crest of the bar which it crosses about 1,500 feet wide and 14 feet deep at mean low water; the smaller branch running about southeast crosses the crest about 900 feet wide and 9¼ feet deep at mean low water.

Capt. Bragg, the principal pilot at Ocracoke, informed me in October, 1892, that the northeast branch channel was slowly shoaling and the southern branch gradually cutting out.

Inside the inlet a fan-shaped bar extends about 5 miles into Pamlico Sound and through this bar are several possible ship channel routes, the principal of which at present are Teachs Hole, Blairs, and Wallace Channels.

Several smaller channels exist, but in their present condition they are unworthy of consideration as possible ship channels.

Teachs Hole route is the only one in use at present. It leaves the main channel from the ocean bar just inside of Ocracoke Point and passes in a north-northeast direction close to Ocracoke Island for 2¼ miles until opposite Ocracoke light, there changing direction to north-northwest, crossing Cockle Shoal into Big Foot Slue and continuing about 1 mile; then it changes direction to west-northwest and crosses the "Swash" into a broad shallow channel opening into Pamlico Sound. Through this the route passes in a northwest direction, crossing an outer swash called Eight-Foot Shoal, 1¾ miles from the inner one, and reaches a depth of 12 feet in open sound about 1 mile beyond the Eight-Foot Shoal channel buoy.

In all this route is nearly 7 miles long from Ocracoke Point to 12-foot depth in Pamlico Sound. The obstructions to 12-foot navigation encountered are Teachs Hole bar, Browns Point Shoal, Cockle Shoal, the "swash," and Eight-Foot Shoal.

Teachs Hole bar has a minimum depth at mean low water of 9.3 feet and is 1,000 feet long between 12-foot curves; mean tide range, 2.2 feet.

Browns Point Shoal is 400 feet long, with least depth of 11 feet at mean low water; mean tide range, 1.6 feet.

Cockle Shoal is 2,200 feet between 12-foot curves, with a least depth of 7 feet; mean tide range, 1.2 feet.

The "Swash" is 6,200 feet between 12-foot curves, with least depth of 7 feet; mean tide range, 0.5 foot.

The "Swash" is really a ridge separating Big Foot Slue from the channel next west opening into the sound.)

Eight Foot Shoal is 7,800 feet between 12-foot curves with a minimum depth of 8 feet; mean tide range, 0.4 foot.

In all, 17,600 feet shoal obstructing 12-foot navigation.

Blairs and Wallace channels are identical and constitute the main channel from the outer bar as far as Beacon Island Slue. This combined channel ranges in depth from 20 to 40 feet, and at no point is less than 800 feet wide between 12-foot contours.

From Beacon Island Slue Blairs Channel runs nearly north about 4 miles and heads in about 2¼ feet water.

From the 12-foot contour at its head over the shoal to the 12-foot contour of Pamlico Sound is 8,800 feet in a northerly direction, but up to its heading the channel is at present in excellent condition and nowhere less than 800 feet wide and 16.2 feet deep.

The Wallace Channel route leaves the combined channel, passes through Beacon Island Slue, and thence in a northwestern direction about 4 miles, heading in about 5 feet of water on Royal Shoal.

The obstructions to 12-foot navigation are at Beacon Island Slue and Royal Shoal.

Beacon Island Slue has least depth of 8 feet at mean low water and is 3,000 feet long between 12-foot contours; mean tide range, 1.4 feet.

Royal Shoal has least depth of about 4¼ feet at mean low water and at location selected for cut is 6,400 feet between 12-foot curves; tide range, 0.4 foot.

Summarizing, considering the main channel at Ocracoke Point as an initial point and estimating for a 12-foot channel, we have:

1. Teachs Hole route, 7 miles long, five shoals with aggregate length of 17,600 feet.
2. Blairs Channel route, 7 miles long, one shoal 8,800 feet long.
3. Wallace Channel route, 7 miles long, two shoals with aggregate length 9,400 feet.

PART 2.—CHANNEL CHANGES FROM 1830 TO 1892.

Maps consulted are as follows:

1830, by Lieut. Dutton, Corps of Engineers.
1835, by Lieut. Swift, Corps of Engineers.
1852, Coast Survey.
1857, Coast Survey.
1877, Coast Survey.
1891, by Lieut. Patrick, Corps of Engineers.
1892, by Lieut. Lucas, Corps of Engineers.

1830. Ocracoke Point was nearly 1 mile north of its present position and Portsmouth Point extended about one-half mile farther into the inlet than it does now.

This map shows four principal channels, Teachs Hole, Blairs, Ship, and Wallace. Teachs Hole route was nearly the same as now, except that Cockle Shoal was crossed farther north and with greater depth. The depth on Teachs Hole bar was 7 feet and on the "Swash" 9 feet.

Blairs channel headed in 5 feet of water instead of 2¼, as now.

Ship channel, now almost closed, was at that time used considerably. It had a minimum depth of 7 feet and extended from Royal Shoal Harbor in an easterly direction, passing north of North Rock and Beacon Island to Blairs Channel which it joined near Beacon Island.

Wallace Channel from Flounder Slue Rock to Ayers Rock was the same as now.

East of Ayers Rock it had two outlets into the inlet, one through Beacon Island Slue, with 5 feet depth, and one opposite Portsmouth Point, with 8 feet depth. Its western outlet was through Flounder Slue with 7 feet depth to and over the swash of Ship Channel.

At this time Wallace Channel headed in Royal Shoal about 1 mile west of Flounder Slue.

With the conditions as shown by this map Lieut. Dutton recommended dredging at Flounder Slue to obtain 10 feet depth at high water.

This plan was adopted and carried into effect, and in 1835 Lieut. Swift, then in charge, reported 8½ feet depth in Flounder Slue, and that the eastern mouth of Wallace Channel was rapidly shoaling. He therefore recommended the construction of two jetties about halfway between Ayers Rock and Portsmouth Point for deflecting the ebb current across the shoal into the inlet channel and thus forming a new and deep mouth for Wallace Channel.

A jetty was nearly finished in pursuance of this project when it was destroyed by a violent storm. Work was abandoned and has not since been resumed.

The map of 1835 shows the formation of Amity Shoal, which was a shoal dry at high water formed on Shark Shoal, but at that date not very extensive.

1852. This map shows some decided changes since 1830.

Amity Shoal had increased in size and the inlet had decreased in width to slightly over 1 mile. Ocracoke Point had receded about 2,000 feet.

Teachs Hole Channel had at its entrance a bar with 5½ feet depth, and for 2 miles it had less than 12 feet. Cockle Shoal had 6½ feet depth and about the same length as in 1892. The "Swash" was about the same as in 1892.

Blairs Channel had disappeared as a channel, though its old course could be traced by a series of deep holes separated by bulkheads.

Ship Channel was still clearly defined, but somewhat shallower, having a least depth of 6 feet.

Wallace Channel at east end was deflected by Amity Shoal into main channel and crossed the shoal with a depth of 12 to 18 feet.

Beacon Island Slue had disappeared.

Wallace Channel was somewhat shallower and at its western extremity had changed its direction more to northwest. It had no western outlet, as Flounder Slue had filled up.

1857. The inlet was slightly wider.

Ocracoke Point had advanced about 500 feet, and Amity Shoal had become a part of Portsmouth Island, but was worn off at end about 1,000 feet. This map does not give Teachs Hole Channel, but no soundings for it seem to have been taken. Its bar, however, had less than 6 feet water.

Blairs Channel was bold and deep as far as shown. It was not used as a ship channel, and probably headed in very shallow water.

Ship Channel was still used and had 5 feet water on bar at its junction with Blairs Channel and 6 feet on Swash Bar at west end.

Wallace Channel had two good mouths at east end with more than 12 feet depth, one through Beacon Island Slue and one near Amity Shoal Point. Its western mouth was through Flounder Slue with about 5 feet depth.

1877. This map shows Teachs Hole route again in use, and Wallace and Ship channels abandoned.

Width of inlet about the same as 1857.

Teachs Hole had about 12 feet depth at bar, 7 feet on Cockle Shoal and Swash.

Blairs Channel headed as now in about 3 feet, but instead of joining Wallace Channel at mouth of Beacon Island Slue it passed north of a middle ground shoal, 7¼ feet least depth, and joined Wallace Channel near mouth of Teachs Hole.

Ship Channel had shoaled to such an extent as to be abandoned.

Wallace Channel at its eastern end passed out through Beacon Island Slue with [illegible] feet depth. It had worked a little farther into Royal Shoal, and headed there with about 6 feet depth.

1891. Inlet again nearly 2 miles wide, Amity Shoal having disappeared.

Ocracoke Point had advanced about 3,500 feet and Portsmouth Point had receded about 1 mile.

Shark Shoal still in same place, and a storm may again throw this above high-water line and re-form Amity Shoal.

It appears that this shoal was above high water in 1818, and acted then as in [illegible]-'77, as a jetty, throwing the ebb current from Wallace Channel across the middle ground shoal and excavating a deep mouth for that channel.

Teachs Hole Channel is not given on this map.

Blairs Channel headed as before in about 3 feet of water, and divided near Beacon Island Slue, one branch crossing the shoal in its channel of 1877, with 12 feet water, and the main channel combining with that portion of Wallace Channel from Beacon Island Slue to form the main channel across the outer bar.

Ship Channel was closed by two bulkheads with 2.8 feet and 3.5 feet water, respectively.

Wallace Channel had advanced still farther into Royal Shoal and headed in about 4 feet water.

At eastern end it divided just below Ayers Rock, one branch passing through Beacon Island Slue and the other branch diminishing in size as its water escaped laterally over shoal until it headed on outer bar in about 6 feet of water.

1892. The present condition of these channels, as shown by survey of September to October, 1892, is nearly as shown by survey of February to April, 1891.

Teachs Hole has 9.3 feet on its bar, Cockle Shoal 7 feet, the Swash 7 feet, and Eight Foot Shoal 8 feet.

Blairs Channel has changed somewhat at its branching near Beacon Island Slue, the upper branch over shoal having decreased in depth to 6 feet from 12 feet, and the lower branch, after joining Wallace Channel, has increased depth of combined channel from 25 to 40 feet.

Wallace Channel has not changed materially since last survey.

Recapitulating and taking the channels separately we find:

Teachs Hole route.—Its four shoals are as follows: Teachs Hole Bar, depth 7 feet in 1830, 5¼ feet in 1852, no channel in 1857, 12 feet in 1877, 9.3 feet in 1892.

Cockle Shoal crossing in 1830 was opposite hotel, but, while maintaining depth of about 7 feet, it has worked south about one-half mile, and is now opposite Ocracoke Light.

The Swash may have had 9 feet depth in 1830, but since 1850 it has not had over 7 feet. Several schooner captains told me last October that it was then in better condition than they had ever before known.

Eight Foot Shoal has had about same depth, but being better than the Swash and easily crossed, whenever latter could be, it has not been much noticed.

2. *Blairs Channel.*—Has always headed about 4 miles north of Beacon Island Slue in about 3 to 5 feet water. Was broad, deep channel in 1830. In 1852, shown as succession of deep holes separated by bulkheads. Cut out again in 1857. In 1877, bulkheaded near Beacon Island Slue, with 7.2 feet depth. In 1892, clear to its head.

3. *Ship Channel.*—Used until 1857, though steadily shoaling. In 1877 it had been abandoned, and has now lost its former channel characteristics.

4. *Wallace Channel.*—*West end:* Has always headed in Royal Shoal; in 1830, west from Flounder Slue, but since 1857 has worked to the northwest, and in last thirty-five years the 12-foot curve has advanced 3,300 feet in that direction. Depth over Royal Shoal has varied from 4 to 6 feet. *East end:* While Amity Shoal was in existence it served as a jetty to force Wallace Channel waters over shoal into inlet channel and a deep mouth was formed, but after Amity Shoal was washed away the water from Wallace Channel, no longer concentrated, spread over Shark Shoal, and the channel mouth shoaled. During past few years the outlet has been through Beacon Island Slue, with least depth of 8 feet. This slue has been cut out by flood currents; but while flood tends to cut it out, the ebb current crosses its inner end obliquely and tends to close it.

PART 3.—GENERAL CONDITIONS GOVERNING CHANNEL CHANGES.

Pamlico Sound is divided into two basins by Bluff Shoal, which begins at Royal Shoal, near Ocracoke Inlet, and extends in a northerly direction to the mainland at Bluff Point. The depth on this shoal is about 10 feet, while on both sides the sound is about 20 feet deep. It probably marks the line of meeting of the two bodies of water from the two basins, moving in opposite directions to Ocracoke Inlet in search of an outlet; and the shoal itself was probably formed by deposit from the waters checked in their movement by so meeting.

The north basin receives the waters of Albemarle Sound and its tributaries and has outlets through Oregon, New, Hatteras, and Ocracoke inlets. Oregon and New inlets are each about one-fourth of a mile wide, Hatteras is about three-fourths mile wide, and Ocracoke about 1¾ miles wide.

Probably more than half of the north basin overflow escapes through Oregon, New, and Hatteras inlets.

The south basin receives the waters of Neuse and Pamlico rivers and their tributaries, and has outlets through Core Sound and Ocracoke Inlet. Probably two-thirds of the south basin overflow passes through Ocracoke Inlet.

At Ocracoke Inlet the waters from the north basin pass through several channels over the inner shoal, while the waters from the south basin are concentrated in Wallace Channel. These channels, meeting at the inlet from different directions, produce shoal-forming conditions, and these conditions are materially affected by the existence or nonexistence of other inlets to the north.

For some years previous to 1840 no northern inlets existed, and Ocracoke Inlet is referred to as the sole outlet for the Albemarle-Pamlico water system in reports to the Chief of Engineers from Capt. Hartman Bache, Topographical Engineers, in 1827; Lieut. William A. Eliason, C. E., in 1828; Lieut. George Dutton, C. E., in 1830; and Lieut. Alec. I. Swift, C. E., in 1835.

Hatteras Inlet is reported as having been formed about 1845, and I believe the effect of the formation of Hatteras and other inlets has been to enlarge Wallace Channel. My reasons for this statement are as follows: These new inlets carry off a large mass of water that formerly passed through Ocracoke, and, considering the water passing through the latter inlet, the percentage from the south basin is now greater than before these inlets were formed. This makes Wallace Channel relatively larger and more important, increases its ability to maintain its own channel, and probably accounts for its recent advance into Royal Shoal.

For many years there appears to have been a steady movement of the inlet to the southwest, and while formerly all the inside channels passed north of Beacon Island, the water passing to and from the south basin now flows south of Beacon Island. Should this movement of the inlet continue it will eventually bring the center of the inlet opposite the fixed position of Wallace Channel, and in that case send most of the flood current up that channel with the lines of direction of flood and ebb currents coincident.

The separation for north and south basins would then occur west of the islands.

PART 4.—CONCLUSIONS.

My conclusion is that Wallace Channel offers decidedly the most promising field for permanent improvement.

I have formed this opinion after making the survey of last September and October, when, in addition to my obtaining an accurate knowledge of the principal channels and shoals, I interviewed many masters of vessels who regularly pass in and out through Ocracoke Inlet, and also as many of the residents of Ocracoke and Portsmouth as had any views to express.

I have also made a careful study of all maps obtainable.

As the principal reason for making the survey was the decided expression of opinion on the part of the great majority of persons answering your circular of May 31, 1892, in favor of improving the Teachs Hole route now in use, it may be well to review the reasons those writers gave in favor of Teachs Hole Channel.

They are summarized in the following extract from my report to you dated July 25, 1892:

"In reply to your circular letter of May 31 many answers have been received indicating some diversity of opinion, but, considering all the answers, there appears to be a decided preference for the north channel route, which is the channel used at present."

The reasons for this preference may be summarized as follows:

1. A cut over North Channel Swash would be through a shoal one-fourth to one-third mile long and carrying 7½ feet of water, while the long cut at west end of Wallace Channel would be through a shoal over 1 mile long and carrying only 3 to 4 feet of water.

2. The bottom at North Channel Swash is said to be stiff clay or mud; in Wallace Channel it is said to be shifting sand.

3. The North Channel has 14 feet depth up to light-house anchorage; thence 12 feet to the swash, 7½ feet depth over swash, and 9 to 10 feet depth on shoal beyond swash. A cut of 10 feet depth would be sufficient, as that is all that can be carried to the ports in these sounds.

4. In the North Channel there is room to beat up to the swash and only a short run through the dredged channel. In Wallace Channel the long run through the cut would, in the opinion of many sea-faring men, prove very difficult of passage for sailing vessels, excepting under most favorable conditions.

There appears to be a difference of opinion as to the best anchorage, but probably that off Ocracoke light is preferable because of its greater depth and the existing facilities at Ocracoke village for refitting and obtaining stores.

It would suffice as a harbor of refuge from the ocean, while Royal Shoal Harbor is now available from the sound.

Answering these reasons in the order given, I have to say concerning—

Reason 1.—To improve the Teachs Hole route to the projected depth of 12 feet would involve dredging through five shoals an aggregate distance of 17,600 feet, including two cuts of 6,200 and 7,800 feet, respectively, which is nearly double the length of dredged channel necessary for making the same improvement in the Wallace Channel route.

The difference in amounts of excavation is given in Appendix A.

Reason 2.—The bottom at the swash is not a stiff clay or mud, as may be seen by samples submitted, but a sand mixed with a small amount of soft mud. When wet it is quite sticky, but is by no means stiff enough to stand against a tidal current, and on this swash both ebb and flood tides flow *across* the channel.

Reason 3.—The North Channel has not a depth of 14 feet to the light-house, as Teachs Hole Bar at high water carries 11¼ feet. It has not 12 feet depth to the swash, because Cockle Shoal intervenes with a minimum depth of 8 feet at high water. Under favorable conditions 7½ feet may be carried over the swash, but on Eight-Foot Shoal, 1¾ miles beyond the swash, there is less than 9 feet depth for 3,000 feet with very little rise of tide.

Reason 4.—The Teachs Hole route for the 2¼ miles from Teachs Hole to the light-house runs north-northeast, and the tidal currents through it are very strong. As the prevailing winds are northeast or southwest a vessel ordinarily encounters in this channel either a fair wind or a head wind, and if the latter, can only beat up against it when the tide is favorable.

The general direction of Wallace Channel from the inlet is northwest, the best possible for the prevailing winds, and as a rule a vessel would have no need of beating through either of the proposed cuts.

The question of anchorage need not enter, excepting as regards Royal Shoal.

Wallace Channel, Blairs Channel, and Teachs Hole are all good anchorages, Teachs Hole having the advantage of being near Ocracoke and the disadvantage of requiring certain favorable conditions for entering or leaving it.

Probably the best anchorage is in Wallace Channel near the islands, and Shell Castle Rock could readily be fitted with storehouses, as it was early in the century, in which could be kept the few stores now obtainable at Ocracoke.

Generally speaking, I believe that any possible northern route would be bad, because it could necessarily terminate on the outer northern slope and be quite unprotected from the frequent northeast gales.

Probably any dredged cut so situated would soon be bulkheaded. This reason applies to the Teachs Hole route, to Blairs Channel, and to Big Foot Slough, which might be used in preference to that part of the Teachs Hole route across the swash and Eight-foot Shoal.

Considering the shoals of the present route, the swash is crossed by both fl and ebb currents, which would rapidly fill up any cut that might be dredged the

Cockle Shoal is not fixed in position, the tendency being for it to move to t south.

Teachs Hole Bar is most uncertain and liable to be bulkheaded at any time l south-east gales, to which it is exposed and which are the most severe of all gales i this locality.

From the statements made to me by many schooner captains there can be litt doubt that Teachs Hole Bar has been bulkheaded more than once since the civil wa and any work of improvement at this point must be subject to sudden dama destruction, or visitation from these violent storms. Ocracoke Point, at Teachs Ho Bar, is the most exposed point inside of the inlet.

For a route through Big Foot Slough it would be necessary to cross Teachs Ho Bar, Browns Point Shoal, Cockle Shoal, and the bulkhead on northern slope, alt gether 8,000 feet of dredging.

Blairs Channel has a long shoal (8,000 feet) at its head and a bad place, liable t be bulkheaded, at its junction with Wallace Channel. In 1877 there was only feet depth at this latter point.

My reasons in detail for preferring the Wallace Channel route are as follows:

1. It connects the good anchorage ground just inside the inlet, which forms a ha bor of refuge from the ocean, directly with Royal Shoal Harbor, a harbor of refug from the sound. This harbor of refuge on the sound side is at times most valuabl and it is the only one in the vicinity.
2. Wallace Channel is confined to the same position for over 2 miles by the diffe ent islands, a fact that insures permanency of position. The other channels have different times occupied different positions through the shoal.
3. Considering the directions of prevailing winds it is decidedly the best locate of all the channels.
4. It is probably the cheapest route available.
5. It offers the straightest channel.
6. It is the direct route to the two important points Washington and Newbern.
7. Royal Shoal, through which the long cut is to be made, is 5 miles from the ocea and entirely protected from the heavy seas of the ocean; the currents are not stron at this distance, and the proposed cut is located in the direction of what current e ists; the western extremity, opening into Royal Shoal Harbor, is as well protecte as possible.

While it cannot be said with certainty that a dredged cut through this shiftin sand can be maintained, I am satisfied that the conditions affecting the permanenc of a dredged cut are much more favorable at this location than at any other possibl

The one objection I find to the Wallace Channel route is at Beacon Island Slough This slough is cut out by the flood current, but the ebb current at this point differs i direction from the flood current by an angle of about 25 degrees, and crossing th mouth of the slough obliquely tends to close it.

It would, perhaps, be advisable to commence a deflecting jetty near Ayers Roc without doing any dredging at this point, as the causes that closed the slough in pre vious years are still in existence, and the present minimum depth of 8 feet probabl marks the limit of depth that can be maintained under these existing conditions But this slough has over 9 feet depth at high water, which is more than sufficient fo any vessels at present passing through the inlet.

Other objections to Wallace Channel route that may exist apply with equal o greater force to any other possible route.

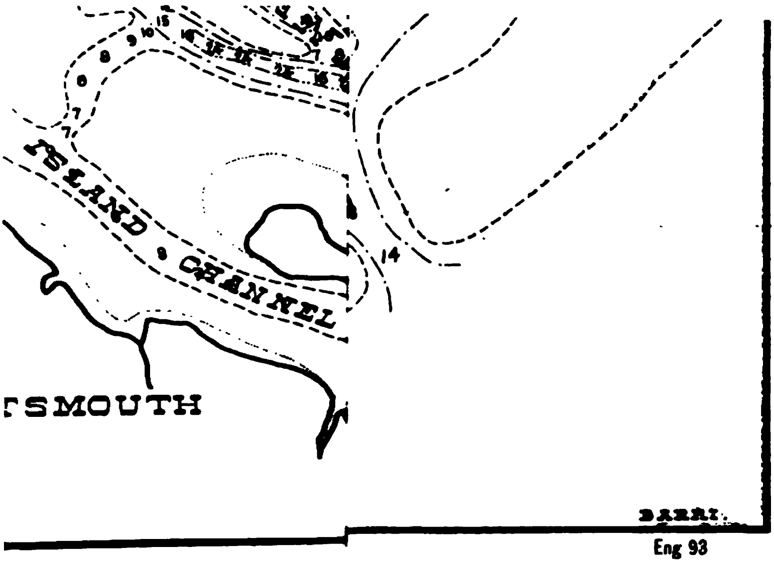
The objections to the Teachs Hole route may be summarized as follows:

1. Crooked.
2. Unfavorable position with respect to wind.
3. Most expensive.
4. Longest cut.
5. Four shoals with small probability of cuts through any of them remainin permanent.

Ocracoke Inlet, North Carolina.

Appropriated—	
March 20, 1826, to March 3, 1837	$133,750.
September 19, 1890	90,000.
July 13, 1892	15,000.
Expended fiscal year ending—	
June 30, 1826 to 1837	*133,732.
June 30, 1891	1,747.
June 30, 1892	478.

*Balance of $18.60 turned over to surplus fund.



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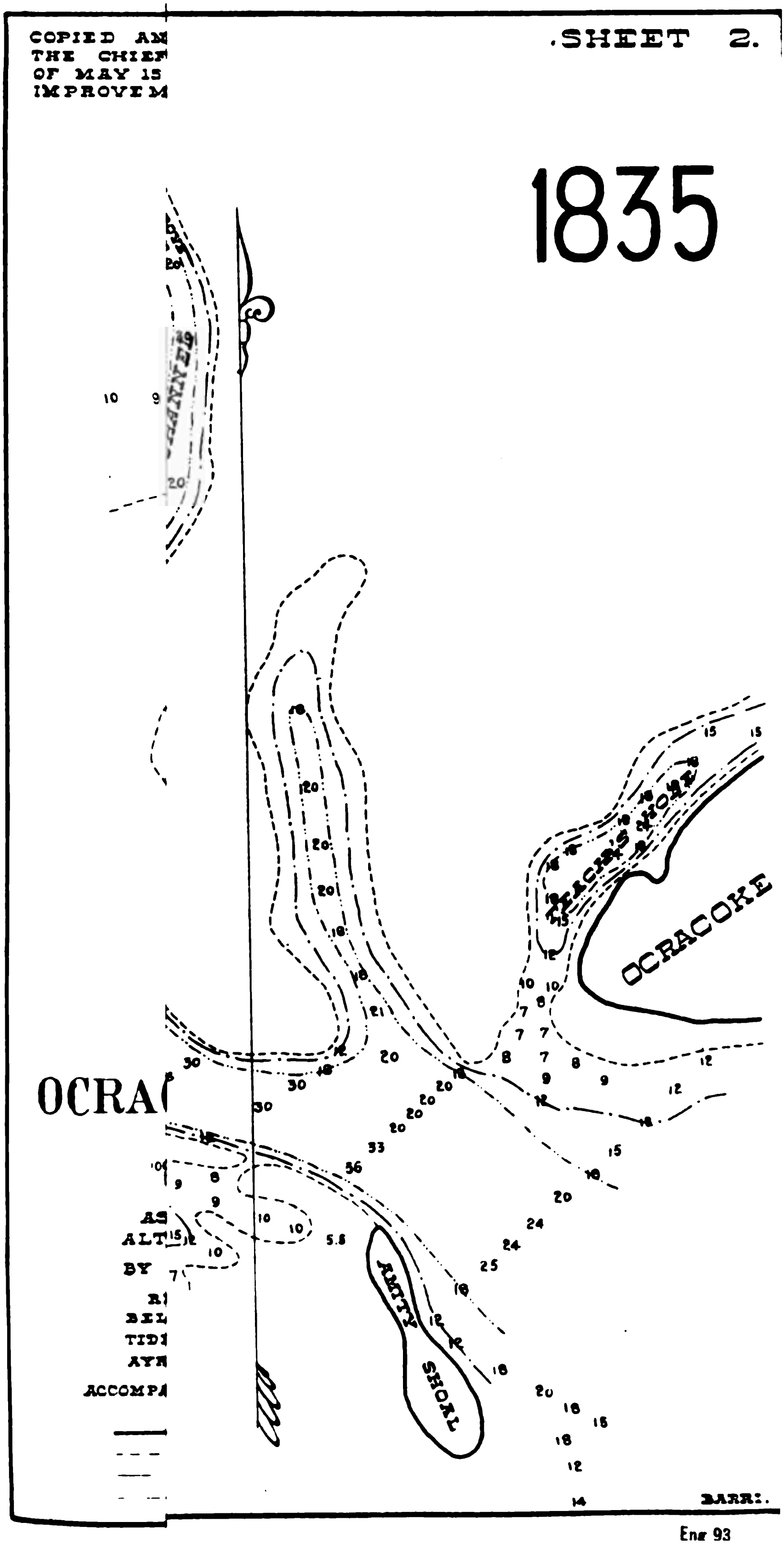
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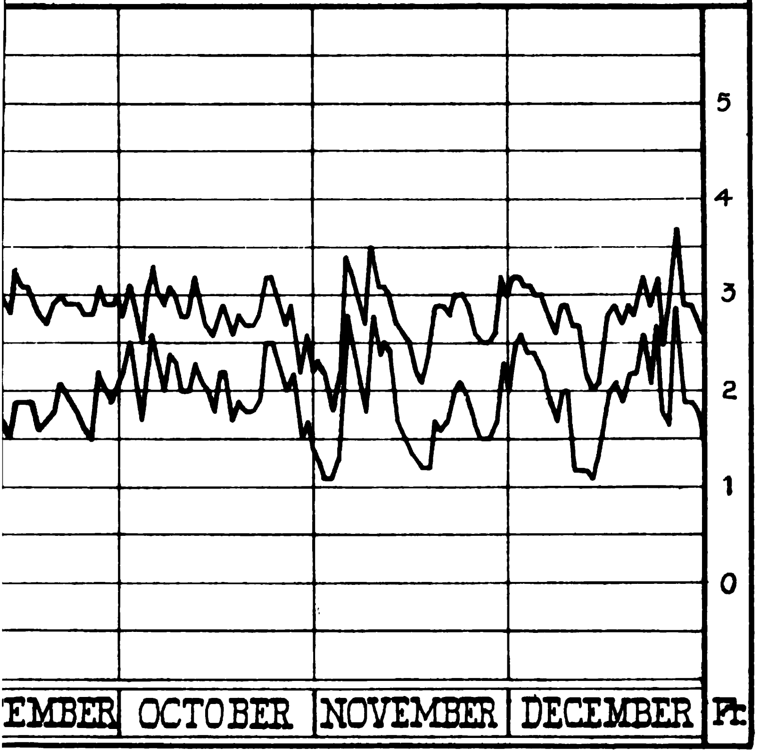
MAJOR, CORPS OF ENGINEERS, U.S.A.



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L 6.

IMPROVEMENT OF FISHING CREEK, NORTH CAROLINA.

The project for its improvement, as stated in a report dated November 23, 1889, of a preliminary examination of this creek (Annual Report of the Chief of Engineers, 1889, pp. 1179–1181) is "to clear out its natural obstructions from its mouth up to Bellamy's Mill at a total expense of about $25,000."

The status of the improvement is explained by the following correspondence:

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., May 31, 1893.

GENERAL: By the acts of September 19, 1890, and July 13, 1892, $15,000 have been appropriated for improving Fishing Creek, North Carolina, which the latter act prescribed "may be expended whenever draws are provided in such bridges as are, in the opinion of the engineer in charge, unreasonable obstructions to navigation."

* * * * * * *

Between Bellamys Mill and its mouth (a distance of about 50 miles) the creek is crossed by nine wagon bridges which have not been provided with draws and which are unreasonable obstructions to navigation; hence no money has been applied to the improvement.

In the "Tarboro Southerner" of March 9, 1893, it appears that at a meeting at Tarboro, in March, of the justices of Edgecombe County, in which lies the greater part of the creek embraced in the project for improvement, it was urged "that whether Fishing Creek was ever navigated or not, the cleaning out which the Government proposed would let the water run off so rapidly that this alone would many times more than compensate them" (meaning the county) in the benefits to be derived from draining the land bordering the creek. * * * Following this argument the justices resolved to put draws in the bridges over Fishing Creek, but at the same meeting declined to put a draw in the highway bridge at Tarboro over the Tar River, 9 miles below its confluence with Fishing Creek.

Having in other ways heard the opinion expressed that there would be very little, if any, navigation on Fishing Creek after its improvement, I, in March last, inspected the creek, passing down it in a skiff from Bellamy's Mill to its confluence with the Tar River, and have since by correspondence and inquiries in person carefully examined the subject.

Up to Bellamy's Mill the creek has a good navigable width (for boats of the class navigating the upper rivers in North Carolina) of 75 to 100 feet. During the average high-water stage of winter and spring the controlling depth on its bars is 3 feet. By building a dike to close one channel at an island, and by a little dredging and rock excavation at a few points, the controlling depth could be increased to 3¼ feet. In the pools the depth is 7 to 10 feet or more. In summer, on the bars, there are only a very few inches of water.

In the first 8 miles from Bellamy's Mill down to the vicinity of the bridge of the Wilmington and Weldon Railroad there is a considerable number of bends so sharp that they would materially hamper navigation. At six of them boats would unavoidably be carried against masses of rock which project from the concave bank at the very points where boats, both going up and down, would collide with the bank owing to the sharp turns and the strength of the current. At another point there is a ledge of rock in the bed of the stream with less than 6 inches of water upon it at mean winter stage and with so tortuous and impracticable a channel around it, a channel about 60 feet in length would have to be cut through it. Besides rock excavation from the bed and banks, a large number of leaning trees would have to be cut and removed. Few snags were seen in the channel at the average high-water stage at which the water was at the date of inspection, and it is impossible to tell how many snags dragging would reveal.

For the lower and greater part of the next 25 miles, from the vicinity of the railroad bridge down to the vicinity of Savage's wagon bridge, besides snags in the channel, the creek is obstructed by large masses of trees and logs, forming in very many places dense barricades spanning the creek from bank to bank and making the descent of the stream slow and tedious even in a skiff. The creek is here occasionally very crooked. In this section of 25 miles the banks are generally not more than 4 or 5 feet above the average winter stage of water, and, excepting occasional high points in the lower 10 miles, are overflowed by several freshets annually. In the upper part of this section for a continuous distance of at least 12 miles there

is not a point on either bank where freight while awaiting shipment wou
cure from damage or from being carried away by freshets, unless placed
forms raised above freshet stages.

The land above overflow in the vicinity of these 25 miles of the creek, s
could be observed where the cultivated fields touch the creek, is very sa
poor, yielding meager crops.

From Savage's bridge to the mouth, a distance by the creek of about 17 m
banks are high, affording frequent landings secure above freshets, the co
more fertile and better cultivated, and the stream much less obstructed tha
There are no heavy barricades and few snags were visible, but from t
greater number seen at my inspection of the 3 miles of the creek next to it
at a low stage of water in May, 1892, than were seen in March it is probabl
many would be found in clearing the channel. However that may be, in
son with the 33 miles above Savage's bridge, the creek below it, about 17
length, is, as regards its own characteristics, adaptability of its banks for l
and the productiveness of the country, more worthy of improvement and
ceptible of improvement at far less cost both actual and proportionate.

Transportation in the region of the stream is chiefly cotton, peanuts, and
exported, and fertilizers and merchandise imported.

The distance of Fishing Creek from a railroad, at no point more than
miles, the number of railroads in the vicinity, and the relative distance fro
railway and by water to Norfolk are shown on the accompanying blue print.

From Bellamys Mill the distance by railroad (from Enfield Station) to No
110 miles, while by water (river, sounds, and canal) it is 307 miles, 87 of whic
Bellamys Mill down to about 2 miles below Greenville on the Tar River, are
that navigation would be stopped for three months or more annually, as it
from Greenville up to Tarboro. For cotton, the principal product in the vic
Fishing Creek, transit by rail to Norfolk, its nearest market, is direct, qui
always to be depended upon, while by water it is circuitous, intermittent,
certain. In some years the low-water season terminates so that navigation
Greenville can be resumed in September, when the movement of cotton to
commences; in others navigation can not be so resumed until December,
large part of the cotton crop has been shipped by rail.

One year ago a practicable channel in the Tar River was cleared of sna
Tarboro (9 miles below the mouth of Fishing Creek) up 40 miles to Rocky Mo
a cost of upwards of $4,000, and no craft whatever, not even a pole boat, ha
year after the completion of the work, commenced to navigate the river b
those points. Meanwhile snags are again gradually accumulating in the cha

Seven or eight years ago four steamboats, respectively of 50, 50 to 60, 125,
tons, plied on the Tar River from Washington up to Tarboro, 48½ miles. No
two remain, of 50 and 125 tons each; the smaller one runs only up to Greenvi
miles above Washington, while the larger one runs up to Tarboro when she
freight, but sometimes she can get no freight to call her above Falkland La
32 miles above Washington, and it is understood that it barely pays her own
run her above Falkland, a point 16 miles below Tarboro and 25 miles bel
mouth of Fishing Creek.

In 1887–'88, snags were removed from Contentnia Creek, North Carolina, form
practicable channel from its confluence with the Neuse up 63 miles by the
(30 by land) to Stantonsburg, but upon the upper 32 miles thus improved
Snow Hill to Stantonsburg, there has not since been any navigation even b
boats. Below Snow Hill a steamboat plies during the high water, and pole
during the low-water season.

Since 1878 the Neuse River has been cleared of snags and overhanging trees
Newbern up 150 miles to Smithfield, to which latter point steamboats ascend
fore the war. After the expenditure of $253,900 for dredging at Newbern, fo
ties between Newbern and Kinston, and for snagging and bank trimming
Smithfield, steamboats now run regularly (except during extreme low water
50 miles above Newbern to Contentnia Creek, and irregularly during the high-
season to Whitehall, 74 miles above Newbern. On the upper 75 miles of the
from Seven Springs to Smithfield, navigation is now very irregular and infreq
rarely extending to Smithfield even by pole boats.

On the upper Roanoke, although its channel has been cleared of snags to W
and 3 feet can be carried to within a mile of that point at low stages, there
navigation whatever above Nicks Landing, 18 miles below Weldon and 111
above the mouth.

The test of experience on these four streams, the Neuse, Contentnia, Ta
Roanoke, has thus failed to show the utility to commerce of improving in tha
of the State (where no naval stores are produced) shallow streams to so great
tance above points which are accessible to steamboats continuously througho
year, freight following those lines of transit which can be relied upon for tra

gation at all times in all seasons. These facts afford little encouragement for the extension 50 miles farther in Fishing Creek of this shoal, intermittent, and unreliable navigation to embrace 87 miles of it in the 106 miles from Washington (which boats can at all times reach from Norfolk) up to Bellamys Mill.

The masses of obstructions spanning Fishing Creek in many places, and those strewed along in the channel, by retarding the flow impound water in the creek which gradually drains down into Tar River as the latter falls, and doubtless appreciably prolongs the season annually during which boats can ascend to Tarboro; so that the statement made to the justices of Edgecombe County, that the clearing out of the creek would drain the land even if of no utility to navigation, and the objection which is strenuously urged by those interested in the boats running on the Tar River, that the removal of so many obstructions from the creek will, by preventing the impounding of water in it, increase their difficulties on the bars and shorten the season when they can run up to Greenville and Tarboro, are both well founded.

Were the obstructions removed from the creek logs would, perhaps, to some extent be taken down it, but this is not a very important consideration, because in rafting logs so long a distance a considerable percentage of them sink, forming dangerous snags which are a pest to navigation on all the rivers in the State; the launching of logs in the stream is restricted where the banks are swampy; and narrow-gauge railroads are building into the timber tracts in that and other parts of the State by which a great deal of lumber is transported to the lower rivers and the sounds, or by all rail route north.

On the bank of the Tar River, about two miles above Tarboro and about 6 below the mouth of Fishing Creek, there is a cotton-seed-oil mill whose owners also own a crude steamer of about 50 tons capacity which runs as a tender to the mill, taking cotton seed to it and oil from it down to Washington. After it is ginned from the cotton the seed shrinks and loses its oil rapidly, and from October, when the new seed becomes available, the mill runs night and day until May, when it closes. In enabling this mill to get cotton seed from the plantations along Fishing Creek the removal of obstructions from the creek would be a material pecuniary benefit to the mill-owners, and the principal owner and manager is understood to have initiated the measures for the improvement of the creek, and to be the principal and most strenuous advocate of its improvement.

The navigation of the Tar River up to Tarboro in completing an all-water (although circuitous) route to Norfolk is doubtless efficacious in keeping down freight rates by rail. The freight and insurance on a bale of cotton from Tarboro to Norfolk by water are $1.45, and the freight by rail is $1.50 (30 cents per 100 pounds). By rail to Norfolk from Halifax, Enfield, and Whittakers stations (see map herewith) it is $1.65 (33 cents per 100 pounds), and from Scotland Neck to Norfolk it is $1.35 per bale.

The country bordering Fishing Creek is situated between the above-named points and two direct railway lines to Norfolk, and has the advantage of the competition between those two lines and the water route, which latter the clearing out of the creek, by lowering the water on the bars below Tarboro, would hamper rather than benefit.

In my opinion, the benefit of improving the creek would be very restricted, extending chiefly to the owners of the cotton-seed-oil mill and not commensurate with the cost.

For all the foregoing facts and reasons, were this report upon a preliminary examination of Fishing Creek, I would express the opinion that, in my judgment, it is not worthy of improvement by the General Government. If it be deemed expedient, nevertheless, to proceed with its improvement, I would recommend that the project be modified to restrict the improvement to clearing the channel to its natural depth from the mouth up about 17 miles to the vicinity of Savages Bridge, at a cost estimated not to exceed $10,000.

The chairman of the county commissioners has informed me that the commissioners will either remove or put draws in all the county bridges below Bellamys Mill, or over so much of the creek as may be improved, when they are notified by me of the extent of improvement that will be undertaken; but they desire to save the county the expense of removing or providing draws in bridges over any part of the creek from which the obstructions will not be removed.

I respectfully request your instructions.

Very respectfully, your obedient servant,

W. S. STANTON,
Major, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. William P. Craighill, Corps of Engineers, division engineer, southeast division.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., June 2, 1893.

Respectfully submitted to the Chief of Engineers.

In consideration of the circumstances detailed by the local engineer it is recon mended that this subject be reported to Congress for further directions.

WM. P. CRAIGHILL,
Colonel, Corps of Engineers.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS,
U. S. ARMY,
June 8, 1893.

Respectfully returned to Maj. Stanton, inviting his attention to the foregoin indorsement of the 2d instant by the Division Engineer.

Maj. Stanton is authorized to submit his views in regard to this improvement i his next annual report. * * *

By command of Brig. Gen. Casey.

H. M. ADAMS,
Major, Corps of Engineers.

Further action of Congress is therefore awaited.

Money statement.

July 1, 1892, balance unexpended	$10,000.(
Amount appropriated by act approved July 13, 1892	5,000.(
July 1, 1893, balance unexpended	15,000.(
Amount (estimated) required for completion of existing project	10,000.(
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867.	

Fishing Creek, North Carolina.

Appropriated—	
September 19, 1890	$10,0
July 13, 1892	5,0

L 7.

IMPROVEMENT OF PAMLICO AND TAR RIVERS, NORTH CAROLINA.

The project is that adopted in 1875 to secure by dredging and remov of war obstructions a clear and safe channel 9 feet deep at low water ı to Washington, extended in 1879 to clear a channel 60 feet wide 3 fe deep at low water 22 miles farther to Greenville, and 20 inches deep low water 26 miles farther to Tarboro; again extended in 1889 to cle the river to its natural dimensions 40 miles farther to Little Falls, tı miles below Rocky Mount, by removal of war obstructions, snags, log stumps, and overhanging trees, at a total final cost estimated in 18 at $137,200.

Under the project $88,000 have been appropriated, and $84,926. expended to June 30, 1893.

A description of the river and a summary of the work accomplish to June 30, 1892, will be found in the Annual Report of the Chief Engineers for 1892, pp. 1118–20.

June 30, 1892, the clearing of snags, logs, and stumps from the channel and of leaning trees from the banks, which had commenced at Little Falls January 26, 1892, had progressed, with two United States hoisters manned by thirty men, down the river 64 miles to a point 2 miles above Greenville.

This work, which had been interrupted June 27 by the high stage of water, was resumed July 13, and between that date and July 28 the Tar River was cleared the remaining 24 miles to Washington by the removal from the channel of 47 logs, 81 trees, 24 stumps, and 55 snags, and from the banks of 12 logs and 157 overhanging trees.

In clearing the 88 miles of the Tar River from Little Falls down to Washington, January 26 to July 28, 1892, the work on the upper 17 miles was original improvement, and on the other 71 miles maintenance of channel previously cleared.

From the latter date to November 20 the force was reduced to six men employed upon the repair of the plant.

From a very careful inspection of the Tar River and investigation in person at Washington, in November, it was apparent that the immediate and most pressing need was the removal of stumps and snags from the channel immediately below Washington, both to speedily give relief to navigation and to prepare the channel for dredging to the depth of 9 feet, which it appears (Annual Report of the Chief of Engineers, 1891, pp. 142, 1433) had been recommended at an estimated cost of $45,000; for, with so great a number of stumps as were found, dredging to obtain an increase of depth of not more than 1 or 2 feet would be very expensive. A United States hoister was therefore set to work November 20 to remove those obstructions, and to June 30, has removed from 6,700 feet of channel below Washington, 812 stumps, 72 large snags, 1 tree, and 102 logs. The number of these stumps found with tops broomed or creased or fiber bent, by the keels of vessels, and the scars and occasional fragments of propeller blades, show them to have been a pest to navigation for years. The bottom is very soft, is very carefully and thoroughly probed for them, and they are being removed to the depth of 9 feet below ordinary low water in preparation for dredging to that depth whenever it may be deemed expedient. Many of the larger stumps are shattered by dynamite before the hoister can raise them.

From a recent careful examination of the channel, and from extensive inquiry among masters and pilots of vessels navigating it, it seems to be assured that on the completion of the removal of the stumps and snags a vessel can ascend the river to Washington at ordinary low water drawing 8 feet, and a pilot states that there are few days during the year when 8½ feet can not be carried up to Washington. Eight feet may be taken as a safe draft.

Vessels can reach Washington, N. C., from the Albermarle or Chesapeake Bay only through the Albemarle and Chesapeake Canal or through the inlets to Pamlico Sound from the ocean. A vessel can draw through the canal not more than 7 feet, over the inner shoals at Ocracoke (the best of the inlets) only 7½ feet, and through Croatan Sound, from Albemarle into Pamlico Sound, only 8 feet. Hence a draught of 8 feet which a vessel can carry up the Pamlico River to Washington when the stumps are removed, is a greater draft than can now be carried to the mouth of that river.

Therefore, the estimate of the amount that can be profitably expended in the fiscal year ending June 30, 1895, does not embrace any money for dredging below Washington.

Between December and May a hydrographic survey was made by Mr. S. F. Burbank of 7.3 miles of river embracing all the shoals between Washington and Tarboro where navigation is obstructed by a deficiency in natural channel depth. These shoals are ten in number as follows:

1. Tripps Shoal, three miles below Greenville, on which the least channel depth is 3½ feet and the distance across the shoal between narrow 4-foot channels is 75 feet.

2. Red Banks Shoal, 2 miles below Greenville, across which there is a 3-foot channel narrowing to a width of 35 feet. With the exception of distances of about 50 feet at each of two places there is a 4-foot channel 2,000 feet in length across this shoal, but too narrow to be practicable for boats.

3. Shoal at Greenville below the steamboat landing, across which there is a 3-foot channel not less than 60 feet wide. From a practicable 4-foot channel below this shoal to the practicable 4-foot channel above it the distance is 70 feet.

4. Shoal at Greenville above the steamboat landing.

5. At Bryants Creek, 5 miles above Greenville.

6. At Reynolds Barn, 6 miles above Greenville.

7. At Big Blue Bank, 7 miles above Greenville.

8. Between the twenty-ninth and thirtieth mile posts.

9. At Reeves Landing, 8 miles above Greenville and 1 mile below Center Bluff.

10. At Williams Mill Run, 5 miles below Tarboro.

Charts of the three former shoals below the steamboat landing at Greenville accompany this report.

Across the six shoals between the steamboat landing at Greenville and Center Bluff there is a continuous 3-foot channel, but for an aggregate distance of 1,400 feet it is less than 60 feet wide, and the six shoals interrupt the 4-foot channel for an aggregate distance of about 2,400 feet.

The foregoing depths on all the shoals below Center Bluff are those at ordinary low water assumed at +1 foot on the gauge at the wagon bridge at Tarboro.

It appears from the charts in this office that that entire part of the river 12 miles in length from Center Bluff down to a point 3 miles below Greenville has been improved by jetties, and from Mr. Burbank's survey it is apparent that the channel dimensions prescribed in the project 60 feet wide with depth of 3 feet up to Greenville, and of 20 inches thence to Tarboro, have been obtained and maintained except at Red Banks where the 3-foot channel narrows to 35 feet and is less than 60 feet wide for a distance of 350 feet.

Center Bluff is the highest point on the river at which boats can rely on getting freight in sufficient quantities to enable them to run with profit, and those who own and control the boats desire the channel depth at that point increased to 4 feet at ordinary low water. This increase of 1 foot in the depth prescribed in the project up to Greenville can be obtained by building about 1,750 linear feet of jetties and is recommended. Between Greenville and Center Bluff the slope of the river is so much greater than below Greenville, an attempt to obtain an increase of at least 1 foot in the present depth (to a depth of 28 inches greater than prescribed in the project) for an aggregate length of 2,400 feet through the six shoals, is not deemed expedient, at least until further investigation and report.

The fall of the river bed in the 48 miles from Tarboro to Washington is reported by Mr. Burbank, who was a member of the party which ran the line of levels in 1882, search for the notes of which has been unsuccessful, to be approximately 12 feet, of which 11½ feet are said to occur in the 26 miles above Greenville. Immediately below Greenville and above the shoal at Red Banks there is a timber lock built by the State of North Carolina about 40 years ago.

The owners of the steamer *Beta* of 50 tons and draught of 3 feet laded, who also own the cotton-seed-oil mill about 3 miles above Tarboro between which mill and Washington the *Beta* plies (as a tender to the mill) have frequently complained of the shoal at Williams Mill Run, 5 miles below Tarboro. From Mr. Burbank's survey it appears that the depth on this shoal at ordinary low water, assumed at +1 foot on the Tarboro gauge, is not less than 20 inches, the depth prescribed in the project, and that to obtain 3 feet would require an increase of 15 inches for a distance of 3,200 feet.

Seven or eight years ago four steamboats of 50, 50 to 60, 125, and 150 tons plied between Washington and Tarboro. Now only two remain, of 50 and 125 tons. The smaller runs from Washington to Greenville and the larger from Washington to Tarboro when she can get freight, but sometimes there is no freight to call her above Center Bluff; and it is understood it barely pays to run her above that point, 16 miles below Tarboro. Railroads have been extended in that vicinity and now cross the river at Rocky Mount, Tarboro, and Greenville and touch it at Washington. From Tarboro to Norfolk by rail the distance is 104 miles and the freight on cotton 30 cents per 100 pounds; by water (the river, sounds, and canal) the distance is 248 miles. It is reported that by an agreement between the railroad and steamboat companies the boats are not to take cotton from the town limits of Tarboro for less rates than by rail. The rates being the same from Tarboro cotton is all shipped by rail.

From Tarboro to Rocky Mount the distance by railroad is 17 miles, while the distance by river, suited only to very shoal navigation, to the rapids at Little Falls, 2 miles below Rocky Mount, is 40 miles. For 23 of these 40 miles, from Tarboro up to Dunbars Bridge, the channel was cleared in 1889 and a practicable channel was again cleared the entire 40 miles from Tarboro up to Little Falls in 1892. Since this work was done in 1889, there has not been a craft of any kind on the river between Tarboro and Rocky Mount except the little steamer *Beta*, which, as before mentioned, runs up to the oil mill, only 3 miles above Tarboro.

The maintenance of a channel that will permit a draft of 4 feet at ordinary low water up to Greenville will much facilitate the transportation of freight throughout the year in that part of the river, and the maintenance of a cleared channel to the controlling depth, 20 inches at ordinary low water, up to Tarboro (although boats will not run above Greenville, or at farthest above Center Bluff at that stage) will serve a useful purpose during the higher stages of water in keeping down rates by rail.

By clearing the channel of snags, etc., from Tarboro to Rocky Mount, the water, being permitted to flow more quickly from that part of the river, is lost for feeding the channel on the shoals below Tarboro during the receding and lower stages. The maintenance of 40 miles of cleared channel above Tarboro, used to a limited degree for only 3 miles, is therefore detrimental to navigation up to that town.

For improving the channel by jetties for 3 miles below Greenville, completing the removal of stumps and snags from the channel below

Washington, for maintaining a channel clear of snags and overhanging trees up to Tarboro, and for contingent expenses, $17,000 should be appropriated for the fiscal year ending June 30, 1895.

The river is in the collection district of Pamlico, N. C.

Money statement.

July 1, 1892, balance unexpended	$3,107.82
Amount appropriated by act approved July 13, 1892	10,000.00
	13,107.82
June 30, 1893, amount expended during fiscal year	9,541.41
July 1, 1893, balance unexpended	3,566.41
July 1, 1893, outstanding liabilities	492.97
July 1, 1893, balance available	3,073.44
Amount (estimated) required for completion of existing project	49,200.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	17,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and sundry civil act of March 3, 1893.

COMMERCIAL STATISTICS.

The commerce for the year ending December 31, 1892, is estimated as follows:

Class of goods.	Tons.	Class of goods.	Tons.
Cotton	3,794	Turpentine, crude and spirits of, and rosin	437
Cotton seed, meal, and oil	1,099	Lumber and its products	63,656
Tobacco	6	Fertilizers	2,500
Rice	568	Machinery	30
Grains	2,185	General merchandise	954
Vegetables, including truck	26,548	Coal and minerals	4,325
Live stock, including poultry	44		
Meats and their products	36		
Fish and shellfish	250	Total	107,097
Tar	665		

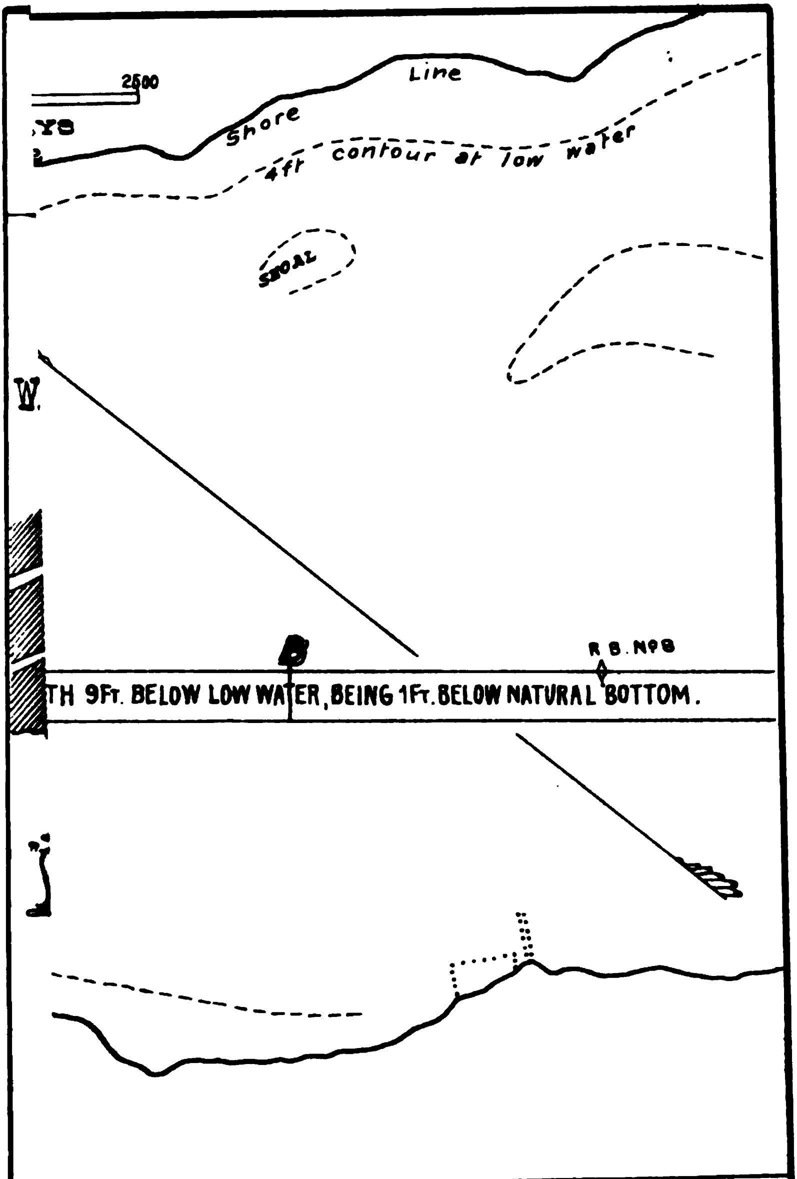
Freight transported.

Calendar year ending Dec. 31—	Tons.
1875	21,0[illegible]
1890	277,8[illegible]
1891	195,6[illegible]

Pamlico and Tar rivers, North Carolina.

APPROPRIATED.

Date.	Amount.	Aggregate.
July 4, 1836, to July 7, 1838	$10,000	$10,000
Aug. 14, 1876	15,000	15,000
Mar. 3, 1879	6,000	21,000
June 14, 1880	9,000	30,000
Mar. 3, 1881	8,000	38,000
Aug. 2, 1882	10,000	48,000
July 5, 1884	5,000	53,000
Aug. 5, 1886	5,000	58,000
Aug. 11, 1888	10,000	68,000
Sept. 19, 1890	10,000	78,000
July 13, 1892	10,000	88,000



WILMINGTON, N.C.

JULY 1893.

TO ACCOMPANY ANNUAL REPORT

W. S. Stanton.

MAJOR OF ENGINEERS.

Pamlico and Tar rivers, North Carolina—Continued.

EXPENDED.

To June 30—		To June 30—	
[illegible] to 1839	$10,000.00	1885	$50,537.10
1877	363.96	1886	52,951.33
1878	12,929.43	1887	56,112.61
1879	14,139.23	1888	57,776.33
1880	20,744.39	1889	64,608.53
1881	29,136.63	1890	66,227.90
1882	35,930.72	1891	68,793.13
1883	39,863.47	1892	75,724.85
1884	45,666.33		

L 8.

IMPROVEMENT OF CONTENTNIA CREEK, NORTH CAROLINA.

The project was adopted in 1881 to obtain a depth of 3 feet from the confluence with the Neuse 63 miles to Stantonsburg during the higher stages of about nine months' duration annually, by clearing the channelway of snags and overhanging trees, by dredging bars, and diking sloughs or outlets, at a cost estimated in 1888 at $77,500.

The stream and its condition in 1881 are described on page 1123 of the Annual Report of the Chief of Engineers for 1892 and on pages 1010 to 1012 of the Report for 1881.

To this date $59,000 have been appropriated and $56,614.41 expended upon this improvement.

To June 30, 1892, the channel had been moderately well cleared from the mouth 31 miles to Snowhill and cleared so as to be practicable the remaining 32 miles to Stantonsburg.

At a personal inspection of this creek in April, 1893, when the stage of water was at +1 foot on the gauge at Snowhill, it was found that the ruling depth on the shoals in the creek was 2½ feet. Allowing a margin of 1 foot, the removal of snags is restricted to a depth of 3½ feet at that stage of the stream.

About 1 mile above the mouth the creek has two channels, and the water also spreads through a cypress swamp. A plank dike, built several years ago across the smaller branch, Spring Slough, to turn the current through the main channel, having been carried away, the depth in the slough is 2.6 feet and only 1.4 feet in the wider channel. In accordance with a recommendation approved by the Chief of Engineers June 9, 1893, a dike will be built at the head of the slough across the main channel to increase the depth in the former, where there is little rise from freshets.

The depth of 3 feet which the project designs to obtain during the higher stages of about nine months annually is found on the bars when the stage is at +1.5 feet on the gauge at Snowhill.

By the record of that gauge during 1889 that or a greater depth prevailed 287 days, or 79 per cent of the time; but in 1890 such depth prevailed only 73 days, or 20 per cent of the time.

Since 1888, when a practicable channel was cleared from Snowhill, 32 miles to Stantonsburg, there has not been even a pole boat on that part of the river, and it does not appear to be in any way useful to commerce to continue the improvement of the creek above Snowhill, 31 miles from its mouth.

The plant is owned jointly by the Contentnia and other works. In

January, 1893, the plant being available, the clearing of the cha snags which had accumulated since the cessation of work was menced at Snowhill, and to this date has progressed to a point 21 below that town, there having been removed during the year fro channel 556 large snags, 11½ cords small snags, 328 stumps, 401 and 304 logs; and from the banks, 186 stumps, 57½ cords small and 861 trees and logs were cut and pulled back.

The steamer *Laura*, of 21 tons, makes regular trips up to Sno a town of 283 inhabitants, and pole boats are used up to that poi

For completing and maintaining a cleared channel up to Sno $7,000 will be required for application during the fiscal year e June 30, 1895. If the channel is to be cleared up to Stantons $15,000 can be applied.

This creek is in the second collection district of North Carolina.

Money statement.

July 1, 1892, balance unexpended	$2,
Amount appropriated by act approved July 13, 1892	7,
	9,
June 30, 1893, amount expended during fiscal year	5,
July 1, 1893, balance unexpended	3,
July 1, 1893, outstanding liabilities	1,
July 1, 1893, balance available	2,3
Amount (estimated) required for completion of existing project	18,5
Amount that can be profitably expended in fiscal year ending June 30, 1895	7,0

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

COMMERCIAL STATISTICS.

The commerce for the year ending December 31, 1892, is estimated as follows:

Class of goods.	Tons.	Class of goods.	To
Cotton	740	Fish and shell fish	
Cotton seed, meal, and oil	438	Tar	
Tobacco	15	Lumber and its products	7
Rice	15	Fertilizers	7
Grains	85	General merchandise	
Vegetables, including truck	54	Coal and minerals	
Live stock, including poultry	20		
Meats and their products	155	Total	17

Freight transported.

Calendar year ending December 31—	To
1890	12
1891	5

K, N.C.

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MAJOR, CORPS OF ENGINEERS, U.S.A.

				13
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MBER	OCTOBER	NOVEMBER	DECEMBER	Ft.

Eng 93

Contentnia Creek, North Carolina.

APPROPRIATED.

Date.	Amount.	Aggregate.
Mar. 3, 1881	$10,000	$10,000
Aug. 2, 1882	10,000	20,000
July 5, 1884	5,000	25,000
Aug. 5, 1886	15,000	40,000
Aug. 11, 1888	5,000	45,000
Sept. 19, 1890	7,000	52,000
July 13, 1892	7,000	59,000

EXPENDED.

To June 30—		To June 30—	
1882	$9,693.99	1888	$39,548.68
1883	19,129.88	1889	43,378.02
1884	20,000.00	1890	43,928.52
1885	23,268,61	1891	48,701.50
1886	24,687.69	1893	49,789.45
1887	34,019.09		

L 9.

IMPROVEMENT OF TRENT RIVER, NORTH CAROLINA.

In 1879 the project was adopted to obtain a depth of 3 feet at low summer stage from the confluence with the Neuse at Newbern, 38 miles to Trenton, by dredging to the width of 50 feet through the shoals and removing snags and overhanging trees, at a cost estimated in 1887 at $59,000, and in 1889 the project was extended to clear the river for navigation by small steamboats 33 miles above Trenton, and for pole boats 6½ miles farther to the Upper Quaker Bridge, at an additional cost of $13,000; the total estimated cost of improving the 77½ miles being $72,000.

To June 30, 1893, $60,500 have been appropriated and $55,763.02 expended under this project.

The river is described and the work done (principally in the 14 miles next below Trenton) is summarized on pp. 1125 to 1127 of the Annual Report of the Chief of Engineers for 1892.

By June 30, 1886, the project had been completed to Trenton. In 1889 a channel 1,700 feet long across Foys Flats, 6 miles above Newbern, was cleared of snags and dredged to the width of 100 feet and depth of 8 feet, the minimum channel depth elsewhere between Newbern and Pollocksville.

The amount, $6,190.64, expended since 1889 has been applied to maintaining the channel up to Trenton, clearing (in 1891) the river for a few miles above Trenton, and to surveys.

From a survey made by Assistant Engineer W. H. Chadbourn, jr., in June, 1893, it appears that the cut, 4,300 feet long, that was dredged about seven years ago to the width of 75 feet and depth of 3 feet at low water in the 1¼ miles next below Trenton has shoaled so that a draft of not more than 18 inches can be carried through it, and that about 1,750 cubic yards of sand will have to be removed by dredging to enable boats to draw 3 feet up to Trenton. That part of the river is so narrow training works can not be used to maintain the depth.

A part of the shoaling is reported to have been caused by the brea of a dam in the creek, when a large quantity of sand was washed into the river.

The turning basin dredged at Trenton to the depth of 6 feet has narrowed by shoaling, and to restore its width to the depth of o feet would entail the removal of about 400 cubic yards of sand.

In the 13 miles from Trenton down to lower Quaker Bridge b encountered snags which have accumulated in the channel sinc worst obstructions were removed from it in 1891, and there are sca ing snags in the channel from Quaker Bridge down to Newbern. Ot wise the channel from Newbern to Trenton is in good condition.

During the fiscal year ending June 30, 1893, work has embraced an examination of the river from Trenton to the upper Quaker Bri a survey of the shoals below Trenton, and the commencement in J of the removal of snags from the channel below Trenton, which i progress.

The Wilmington, Newbern and Norfolk Railroad Company, in ext ing their route from Jacksonville to Newbern, have built a bridge the river at Pollocksville with two draw spans, with clear avail widths of 29 and 30 feet each.

In the river above Trenton there are many bars of sand and som rock or gravel. The depth at ordinary low water does not exceed u a great many of them 18 inches, upon a considerable number 1 foot, upon some a few inches. Its oscillations are frequent, and its drain basin being small, there are said to be many periods of low wate the winter season. Were it cleared of the great number of snags t choke it, of the leaning trees that obstruct it, and were some of worst bars and some of its sharpest bends improved, all of which wo be necessary to make it practicable for small, light-draft steame navigation would still be very intermittent and would probably n embrace more than six months annually. If it be cleared out the co munity expect to be benefited quite as much by the drainage of t land as by navigation. The drainage which the clearing of the chan will permit will diminish the depth and protract the period of low wa on the shoals both above and immediately below Trenton, and be unfa orable to the present navigation up to that town.

There is another tributary of the Neuse, Contentnia Creek, which reported to drain a basin nearly twice as large as the Trent's, is b lieved to have a better depth of water throughout the year, is natu ally more practicable for boats, flows through a country at least as fe tile and well cultivated as that bordering the Trent, and not bett provided with transportation facilities. In the Contentnia in 1887- an entirely practicable channel was cleared from the mouth 63 mil to Stantonsburg, on the upper 32 miles of which from Snowhill t Stantonsburg there has not since been any craft, not even a pole boa The upper part of the 77 miles of the Trent, for a considerable distan below upper Quaker Bridge, is less practicable than the Contentni up to Stantonsburg.

I have personally inspected both these streams and from experien with the Contentnia am of the opinion that if the Trent were to be im proved above Trenton there would be little at most, and probably no navigation upon it.

The balance, $4,736.98, of funds now available is sufficient for th maintenance of the channel up to Trenton during the fiscal year end ing June 30, 1895. If this improvement is to be continued abov Trenton $13,000 additional can be applied during that year.

This river is in the collection district of Pamlico, N. C.

R, N.C.

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MAJOR, CORPS OF ENGINEERS, U.S.A.

EMBER	OCTOBER	NOVEMBER	DECEMBER	Ft.
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				3
				2
				1
				0

Eng 93

Money statement.

July 1, 1892, balance unexpended	$608.72
Amount appropriated by act approved July 13, 1892	5,000.00
	5,608.72
June 30, 1893, amount expended during fiscal year	446.50
July 1, 1893, balance unexpended	5,162.22
July 1, 1893, outstanding liabilities	425.24
July 1, 1893, balance available	4,736.98
Amount (estimated) required for completion of existing project	11,500.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867.	

COMMERCIAL STATISTICS.

The commerce for the year ending December 31, 1892, is estimated as follows:

Class of goods.	Tons.	Class of goods.	Tons.
Cotton	1,050	Tar	120
Cotton seed, meal and oil	200	Turpentine, crude and spirits of, and resin	75
Tobacco	20	Lumber and its products	54,000
Rice	20	Fertilizers	600
Grains	150	Machinery	60
Vegetables, including truck	600	General merchandise	2,500
Live stock, including poultry	20		
Meats and their products	155		
Fish and shell fish	6	Total	59,576

Gain over last year, 14,496.
Transportation lines established during the year, none.

Freight transported.

Calendar year ending December 31—	Tons.
[illegible]	22,000
[illegible]	39,985
[illegible]	45,080

Trent River, North Carolina.

APPROPRIATED.

Date.	Amount.	Aggregate.
Mar 3, 1879	$7,000	$7,000
June 14, 1880	10,000	17,000
Mar. 3, 1881	5,000	22,000
Aug 2, 1882	10,000	32,000
July 5, 1884	10,000	42,000
Aug. 5, 1886	3,500	45,500
Aug. 11, 1888	5,000	50,500
Sept. 19, 1890	5,000	55,500
July 13, 1892	5,000	60,500

EXPENDED.

To June 30—		To June 30—	
1880	$6,871.63	1887	$42,031.73
1881	17,151.43	1888	42,704.98
1882	22,000.00	1889	49,572.38
1883	23,597.38	1890	50,379.41
1884	32,000.00	1891	53,897.07
1885	41,329.56	1892	54,916.78
1886	41,464.06		

L 10.

IMPROVEMENT OF NEUSE RIVER, NORTH CAROLINA.

A description of this river and a brief summary of work upon it b the State of North Carolina in 1856–'57 and by the United States sinc its commencement in 1878 will be found on pages 1129–1131 of th Annual Report of the Chief of Engineers for 1892.

The project of 1871, modified or extended in 1878, 1879, 1880, an 1883, and continued without modification since the latter date, propose to remove the war obstructions, to clear the channel up to Smithfiel of all snags, logs, and overhanging trees, "and to contract the channelway by jetties so as to assure during the entire year an unobstructe 8-foot navigation 40 miles up to Newbern and a similar 4-foot navigation 50 miles farther to Kinston, and during nine months of the year a 3-foot navigation 100 miles farther to Smithfield," at a total final cos estimated in 1888 at $374,000.

Under this project $282,500 have been appropriated and $262,535.4 expended to June 30, 1893.

The plant pertaining to this improvement belongs to it and othe rivers, was much deteriorated, has been thoroughly renovated, and th hoister made self-propelling. Since its renovation was completed thi plant has been in use upon the other rivers to which it pertains an where the necessity for its use was immediate and urgent.

Eight of the worst shoals between Newbern and the mouth of th Contentnia have been surveyed during the year for the location of jetties to be built of brush and stone for their improvement.

By authority from the Chief of Engineers of April 10, 1893, a smal and very light draft steamer, the *Gen. George Thom*, is building at th depot at Washington for towing scows loaded with brush and stone fo building jetties on the shoals in the Neuse and the Tar rivers. The boa will be equipped with boiler and machinery on hand and formerly i use on hoisters.

Up to Newbern, 40 miles above its mouth, in Pamlico Sound, draft of 8 feet can be carried, and the channel is frequented b steamers and barges, plying, one steamer between Newbern and Elizabeth City on the Pasquotank and the others and the barges betwee Newbern and Norfolk through the Albemarle and Chesapeake Cana The route from Newbern to Elizabeth City and Norfolk lies throug Croatan Sound, through which only 8 feet can be carried, and the rout to Norfolk continues through the Albemarle and Chesapeake Cana through which not more than 7 feet can be carried. Seven and on half feet is all that can be carried from the Neuse through Ocracok Inlet to the sea. The Neuse has a channel in good navigable conditio for boats of 8 feet draft up to Newbern and answering all prese demands of navigation up to that city.

From Newbern one and sometimes two small light-draft steame ply up the Neuse and the Contentnia, which flows into it 31 miles abo Newbern. Only 2½ feet can be carried up the Contentnea at ordina high water and about 2 feet at ordinary low water up to its mouth ov the shoals in the Neuse, and thence to Kinston. The main chann from the mouth up to Kinston is, as regards snags and overhanging tree in good navigable condition. From the mouth of the Contentnia up 1 miles to Kinston all steamboats have ceased to run on the Neuse by a agreement between the owners of the boats and the railroad companie the Neuse being paralleled by the Atlantic and North Carolina rai road, two-thirds of whose stock belongs to the State of North Carolina. On the other bank the river is also closely paralleled from Kinston to the Contentnia by a branch of the Wilmington and Weldon railroad running from Kinston to Greenville on the Tar River, and thence north.

Above Kinston navigation is only by pole boats, 25 miles by river to Seven Springs.

Sometimes in the high-water season steamers have run irregularly to White Hall, 24 miles above Kinston, when there was freight to go up to or down from that point.

The maintenance of a navigable channel for light-draft boats from Newbern to Kinston would doubtless serve a useful purpose in controlling freight rates by railroad, and the balance now available, $19,964.58, is adequate for that purpose to June 30, 1895.

This river is in the collection district of Pamlico, N. C.

Money statement.

July 1, 1891, balance unexpended	$8,724.82
Amount appropriated by act approved July 13, 1892	15,000.00
	23,724.82
June 30, 1893, amount expended during fiscal year	2,810.27
July 1, 1893, balance unexpended	20,914.55
July 1, 1893, outstanding liabilities	949.97
July 1, 1893, balance available	19,964.58
Amount (estimated) required for completion of existing project	91,500.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867.	

COMMERCIAL STATISTICS.

Product of lumber mills at Newbern, N. C., during year ending December 31, 1892, forwarded from Newbern by following routes:

	Feet.
Via Ocracoke (south)	300.000
Via Ocracoke (north)	5,175,000
Via Albemarle and Chesapeake Canal	23,425,000
Via water to Elizabeth City	13,450,000
Via railroad (north)	4,750,000
Via Hatteras (south)	150,000
Via Hatteras (north)	6,500,000
Total	53,750,000

List of vessels plying between Newbern, N. C., and other ports during the year end December 31, 1892.

Name.	Net tonnage.	Name.	Net tonnage
STEAMERS.		SAILING VESSELS—Continued.	
Neuse	487.04	M. and A. Beswick	......
Vesper	292	Maggie and Nellie	......
Geo. H. Stout	344.52	Jennie E. Marshall	19
Newberne	344.52	Lula M. Quillen	12
Defiance	424	Lizzie S. James	18
Annie	246.50	Frank Hodges	4
Enola	194	S. Warren Hall	16
Sadie M. Rand	101	Mattie E. Hiles	8
Carolina	89	Baltimore	7
L. H. Cutler	30.49	Dorchester	6
Vanceborough	52.41	Robert F. Bratton	5
R. E. Lee	69	Sallie and Ellen	12
Kinston	97.43	Thos. S. Shryock	17
Laura	14	Geo. A. Howes	15
Nettie W	18	Eunity R. Dyer	10
L. A. Cobb	49	S. A. Rudolph	20
Trent	75.97	J. Hillis	29
Virginia	....	Ida G. Farren	5
Glide	20.94	Robert Coulter	5
Ella	15.45	George Faulane	5
Higgins	12.74	Harlow W. Houston	18
Swan	12.16	James S. Watson	14
Hygia	....	Annie E. Reynolds	8
Wm. R. McCabe	263.94	Three Brothers	13
Harry	100	Wm. P. Davis	12
Eaglet	339	J. Dallas Marvil	16
Elko	372	Addie	......
Greenville	68.92	Cherubim	9
Albemarle	75.19	Frank S. Hall	16
Alpha	154.63	Gertrude Browning	......
		Hattie Dorman	......
SAILING VESSELS.		C. E. Davidson	......
		Jas. B. Anderson	15
J. E. NcNaughton	89	Regular	4
A. Booth	71.29	Annie McNally	10
Nannatawney	....	Hannah E. Predmore	4
Margaret F. Moore	42.80	Ada Jones	1
Melvin	172	Thos. B. Cator	4
Addie Henry	72	Three Friends	1
Bernice W. Baker	34.94	Bertie and Maude	1
Martha Skinner	47.53	Grace D. Bennet	1
Carrie Farson	46.08	William Donnelly	1
Hulda	66.33	Centennial	......
Thos. H. Hooper	46.03	Cora	......
John R. P. Moore	....	Sevin J. Marvel	......
Minnie and Emma	77.83		

The commerce for the year ending December 31, 1892, is estimated as follows:

Class of goods.	Tons.	Class of goods.	Ton
Cotton	3,385	Turpentine, crude, and spirits of, and rosin	3
Cotton seed, meal, and oil	180	Lumber and its products	177
Tobacco	17	Fertilizers	9
Rice	245	Machinery	
Grains	6,500	General merchandise	29
Vegetables, including truck	17,500	Coal and minerals	2
Live stock, including poultry	170		
Meats and their products	1,125	Total	253
Fish and shell fish	1,680		
Tar	240		

Decrease over last year, 13,946 tons.

Transportation lines established during year, none.

The cause in apparent decrease in Neuse River statistics is partly previous o estimates and partly a loss in cotton exports.

Freight transported.

Calendar year ending December 31—	Tons.
[illegible]	75,000
[illegible]	328,462
[illegible]	267,650

Neuse River, North Carolina.

APPROPRIATED.

Date.	Amount.	Aggregate.
June 18, 1878	$40,000	$40,000
Mar 3, 1879	45,000	85,000
June 14, 1880	45,000	130,000
Mar 3, 1881	30,000	160,000
Aug 2, 1882	30,000	190,000
July 5, 1884	20,000	210,000
Aug 5, 1886	22,500	232,500
Aug 11, 1888	15,000	247,500
Sept 19, 1890	20,000	267,500
July 13, 1892	15,000	282,500

EXPENDED.

To June 30—		To June 30—	
1879	$29,321.11	1886	$205,825.72
1880	66,754.90	1887	220,040.38
1881	105,134.05	1888	226,017.60
1882	148,607.44	1889	233,267.77
1883	172,218.51	1890	245,498.43
1884	184,137.03	1891	253,900.86
1885	196,268.80	1892	258,799.08

L II.

IMPROVEMENT OF INLAND WATERWAY BETWEEN NEWBERN AND BEAUFORT, N. C., VIA CLUBFOOT, HARLOWE, AND NEWPORT RIVERS.

A description in detail of this waterway, a summary of the work done to June 30, 1892, and the present status of its improvement will be found on pages 1134, 1135 of the Annual Report of the Chief of Engineers for 1892.

The first 21 miles of this waterway are below Newbern in the Neuse River, where the controlling channel depth is 8 feet. The improvement, therefore, pertains only to 18 miles of shallow waterway which crosses the narrowest part of the peninsula lying between the Neuse on the north and Bogue and Core sounds on the south.

The route embraces 5 miles in the Clubfoot River (flowing into the Neuse), 4 miles in Harlowe Creek, a branch of the Newport River, and 6 miles in the latter, which flows into Beaufort Harbor, making 15 miles of natural channel; also 3 miles of canal at the summit, connecting Clubfoot River and Harlowe Creek, and owned by the Newbern and Beaufort Canal Company.

The project of 1884 is to obtain a channel 30 feet wide at bottom and 5 feet deep at low water from the Neuse to the 5-foot channel in Newport River, at a cost (including the completion of the canal) estimated in 1886 at $92,000.

To June 30, 1893, $35,000 have been appropriated and $27,416.46 expended under this project in dredging in the natural channels and clearing them of logs and stumps.

The controlling depth through this route is now the depth in the canal, which is 2 feet at ordinary low and 3½ feet at ordinary high water.

Since 1890 dredging to obtain the depth of 5 feet, prescribed in the project, has been suspended to await the deepening of the canal by the company owning it or its cession to the United States, and work has been restricted to maintaining in the natural parts of the route a channel cleared of logs to the depth of water that there is in the canal.

During the fiscal year ending June 30, 1893, 141 logs have been removed from Clubfoot River and Harlowe Creek, and navigation is now unobstructed by logs except in the the canal, where they considerably interfere with boats.

Inquiry has been made if, and upon what terms, the company will cede the canal to the United States, so that it can be kept likewise cleared of logs, or that the deepening of the route to 5 feet may be resumed if Congress deem it expedient to appropriate the necessary funds, but reply has not yet been received.

The amount, $7,583.54, now available, is more than sufficient for the maintenance of a cleared channel during the fiscal year ending June 30, 1895.

Money statement.

July 1, 1892, balance unexpended	$7,870.02
June 30, 1893, amount expended during fiscal year	158.84
July 1, 1893, balance unexpended	7,711.18
July 1, 1893, outstanding liabilities	127.64
July 1, 1893, balance available	7,583.54
Amount (estimated) required for completion of existing project Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867.	57,000.00

Statement of vessels passing through waterway between Newbern and Beaufort, N. C., during the months of May and June, 1893.

One hundred and sixty-nine vessels with a given tonnage of 1,782 tons; 51 vessels for which tonnage is not given, together with 8 rafts of logs valued at $1,510.

Freight transported.

Calendar year ending December 31—	Tons
1890	14,000
1891	11,[illegible]

Inland waterway between Newbern and Beaufort, N. C.

APPROPRIATED.

Date.	Amount.	Aggregate.
Aug. 2, 1882	$10,000	$10,000
Aug. 5, 1886	10,000	20,000
Aug. 11, 1888	15,000	35,000

EXPENDED.

To June 30—		To June 30—	
1884	$194.40	1889	$24,[illegible].43
1885	2,074.31	1890	26,[illegible].12
1886	2,205.76	1891	27,[illegible].40
1887	3,499.25	1892	28,1[illegible].96
1888	6,812.45		

L 12.

IMPROVEMENT OF HARBOR AT BEAUFORT, N. C.

The project of 1881 was to stop the erosion of Fort Macon and Shackleford points by jetties; to prevent the widening and shoaling of the entrance to the harbor itself by deposit of eroded material; to dredge a channel 200 feet wide and 9 feet deep at low water from the Bulkhead Channel 1,950 feet to the wharves at Beaufort; and to dredge a channel 100 feet wide and 6 feet deep at mean low water from the 6-foot contour at Beaufort down the Old Town Channel and north of Horse Island to the 6-foot contour leading to North River, a distance of 12,670 feet.

In 1887 the project was modified by postponing for the present the dredging of the cut through the Old Town Channel to North River, and by reducing to the width of 100 feet and depth of 5 feet the channel to be dredged from the Bulkhead Channel to Beaufort; in 1890 the project was again modified by increasing the latter dredging to the depth of 7 feet at a cost estimated in 1887 at $163,000.

To June 30, 1893, $150,000 have been appropriated and $137,422.37 expended under this project.

A description of the harbor and a summary of the work accomplished will be found on pages 1137–1139 of the Annual Report of the Chief of Engineers for 1892.

During the year ending June 30, 1893, under a contract entered into with the Alabama Dredging and Jetty Company, December 24, 1890, 20,585.4 cubic yards of sand were dredged from the channel extending from the Bulkhead Channel to Beaufort, costing, at 33⅓ cents per cubic yard, $6,861.80. In 1889 that channel had been dredged for its entire length to the width of 50 feet and depth of 5 feet, and under the foregoing contract with the Alabama Dredging and Jetty Company from the commencement of work, April 21, 1892, to October 24, 1892, 30,575 cubic yards had been removed, leaving a channel 1,895 feet long, 100 feet wide, and 7 to 8 feet deep at mean low water. The dredging under this contract was with a suction dredge and the material was discharged through a pipe forming an embankment above mean high water about 100 feet from the cut. The contract provided for dredging to the amount of from $10,000 to $12,000.

When, after October 24, 1892, the minimum amount of dredging prescribed in the contract had been done, a draft of 6 feet could be carried at low water from the end of the dredged channel to the Bulkhead Channel, which draft is as great as can be carried over a shoal formed at the junction of the Bulkhead Channel with the main channel leading to the harbor entrance (see chart herewith). On this latter shoal a greater depth can not probably be obtained and maintained without expensive regulating works, and as the depth of 6 feet seems adequate to the present needs of commerce, work under the contract was stopped when the minimum limit had been reached.

Minor repairs to the sand fences at Fort Macon and Shackleford points have been in progress throughout the year.

A dike of oyster shells covered with stones, which can be built from Round Rock to Pivers Island, at an estimated cost of $3,500, would permit the preservation of the dredged channel, and a project will be submitted for building it with funds available.

The amount available, $12,577.63, is adequate to requirements during the fiscal year ending June 30, 1895.

Extensive accretion to Bird Island Shoal in this harbor and resulting deterioration of the Old Town Channel, whose improve was embraced in the project of 1881 but postponed in the proje 1887, are described in a report published in House Ex. Doc. No. Fifty-second Congress, second session, incorporated in the Repor the Chief of Engineers for this year.

Beaufort is a port of entry.

Money statement.

July 1, 1892, balance unexpended	$14,0
Amount appropriated by act approved July 13, 1892	10,0
	24,0
June 30, 1893, amount expended during fiscal year	11,3
July 1, 1893, balance unexpended	12,7
July 1, 1893, outstanding liabilities	1
July 1, 1893, balance available	12,5
Amount (estimated) required for completion of existing project	13,00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867.	

COMMERCIAL STATISTICS.

The commerce for the year ending December 31, 1892, is estimated as follows:

Class of goods.	Tons.	Class of goods.	To
Cotton	250	Turpentine (crude) and spirits of, and resin	
Tobacco	60	Lumber and its products	6,
Rice	80	Fertilizers	2,
Grains	400	Machinery	
Vegetables, including truck	1,500	General merchandise	19,
Live stock, including poultry	450	Coal and minerals	2,
Meats and their products	25		
Fish and shell fish	20,000		
Tar	25	Total	55,

Decrease over last year, 14,260 tons.

Transportation lines established during year, none.

Concerning the commercial statistics of harbor at Beaufort, N. C., Assistant En neer Chadbourn has to say: "That the data I was able to obtain at Beaufort w very meager and incomplete, therefore, the estimate submitted is almost complet an estimate made from general information gathered in conversation and a kno edge of a considerable falling off in certain lines."

Freight transported.

Calendar year ending Dec. 31—	Tons.
1880	25,
1890	46,
1891	69,

Harbor at Beaufort, N. C.

APPROPRIATED.

Date.	Amount.	Aggregate.
July 4, 1836	$5,000	$5,000
Mar. 3, 1881	30,000	30,000
Aug. 2, 1882	25,000	55,000
July 5, 1884	20,000	75,000
Aug. 5, 1886	15,000	90,000
Aug. 11, 1888	35,000	125,000
Sept. 19, 1890	15,000	140,000
July 13, 1892	10,000	150,000

EXPENDED.

To June 30—	
1837	$5,000.00
1882	4,102.91
1883	37,930.61
1884	43,801.04
1885	72,781.44
1886	75,000.00

To June 30—	
1887	$83,086.19
1888	88,869.48
1889	101,972.62
1890	122,034.43
1891	123,673.34
1892	128,355.31

L 13.

IMPROVEMENT OF INLAND WATERWAY BETWEEN BEAUFORT AND NEW RIVER, N. C.

This waterway is 50 miles long and lies from Beaufort for 28 miles in Bogue Sound nearly to Swansboro; from the westerly end of Bogue Sound, 22 miles to New River, it follows intricate tidal sloughs varying from 1,000 feet to 12 feet in width, from 10 feet to 6 inches in depth at high water, and winding through a marine marsh filling the area between the outlying barrier beach and the mainland.

Swansboro is opposite Bogue Inlet and at the mouth of White Oak River. Five and one-half feet can usually be carried over the changeable bar at the inlet, and boats of 3 feet draft can ascend from this waterway up White Oak River about 24 miles, or 16 miles in an air line.

The project embraces only the 28 miles from Beaufort to Swansboro, and was approved in 1885 to dredge a channel 100 feet wide and 3 feet deep at low water through the shoals between those points, at a cost estimated in 1887 at $50,000.

Under this project $40,000 have been appropriated and $30,299.83 expended to June 30, 1893, at which date a channel not less than 3 feet deep at low water had been obtained by dredging through six shoals, aggregating in length about 4 miles, as follows:

1. Sally Bell Shoal, 8.1 miles from Beaufort, 980 feet long and 100 feet wide.
2. Broad Creek Shoal, 16.6 miles from Beaufort, 2,800 feet long and 45 feet wide.
3. Sanders Creek Shoal, 18.3 miles from Beaufort, 11,695 feet long and 45 feet wide.
4. Goose Creek Shoal, 21.1 miles from Beaufort, 3,750 feet long and 45 feet wide.
5. Turtle Slough, off Guthries Point, three shoals, commencing about 22 miles from Beaufort, aggregating 1,840 feet in length, 60 feet wide.
6. Shoal at Cross Stake Slough, 26 miles from Beaufort, 1,015 feet long and 60 feet wide.

The first five of the foregoing shoals are in Bogue Sound; the last, at Cross Stake Slough, is in a channel in the marsh about 2 miles from Swansboro.

A large part of the traffic then going through Bogue Sound continued past Beaufort in boats of light draft through the Newport and Harlowe rivers, Clubfoot and Harlowe Canal, and Clubfoot and Neuse rivers to Newbern. As 3 miles of this route through the canal and nearly 2 miles of it through the dredged channel in Harlowe Creek is only 30 feet wide, the minimum width of 45 feet of the channel dredged through the shoals in Bogue Sound was deemed sufficient to accommodate traffic there, and it was recommended from this office, June 18, 1892, that no further funds be applied to widening the channel through the shoals in Bogue Sound until experience in its use shall prove the minimum width obtained to be inadequate to the requirements of commerce.

August 4, 1892, the Secretary of War approved the recommendation of the Chief of Engineers that the $10,000 appropriated July 13, 1892, be withheld from expenditure until experience shall show whether it be necessary.

During the fiscal year ending June 30, 1893, work has been restricted to surveys.

A year ago 6,000,000 feet of lumber were shipped annually from White Oak River, of which 5,000,000 feet then went out through Bogue Inlet and about 1,000,000 feet through Bogue Sound. Owing to the changeable character of the bar at that inlet and to the establishment of mills near Morehead City where it is dressed, the entire 6,000,000 feet of lumber annually are now to be shipped through Bogue Sound. It is transported in barges 86 by 20 feet and carrying about 40,000 feet each, towed by a tug of 20 feet beam, drawing 4 feet of water when loaded with 20,000 feet of lumber.

It was understood at the date of the last report that a draft of 3 feet could be carried through the sound from Swansboro to Beaufort, but boatmen have complained that there is a less depth between the channels dredged through the shoals at Sanders Creek and Goose Creek, and also in the two intervals between the three cuts at Turtle Slough. From a survey made in 1893 by Assistant Engineer W. H. Chadbourn, jr., it appears that only 2½ feet at low water can be carried over those localities.

A project will, therefore, be submitted to at once apply the $10,000 appropriated by the act of July 13, 1892, to dredging at these localities and to increasing the minimum width of the dredged channels to 60 feet, all the dredging to be to the minimum depth of 4 feet at low water.

This waterway is in the collection district of Beaufort, N. C.

Money statement.

July 1, 1892, balance unexpended	$1,911.10
Amount appropriated by act approved July 13, 1892	10,000.00
	11,911.10
June 30, 1893, amount expended during fiscal year	2,210.93
July 1, 1893, balance unexpended	9,700.17
Amount (estimated) required for completion of existing project	10,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	10,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

Freight transported.

Calendar year ending December 31—	Tons.
[illegible]	12,250
[illegible]	29,332
[illegible]	30,240

Inland waterway between Beaufort and New River, N. C.

APPROPRIATED.

Date.	Amount.	Aggregate.
Aug. 5, 1886	$10,000	$10,000
Aug. 11, 1888	5,000	15,000
Sept. 19, 1890	15,000	30,000
July 13, 1892	10,000	40,000

EXPENDED.

To June 30—		To June 30—	
1887	$410.57	1890	$14,637.89
1888	6,676.51	1891	19,504.81
1889	14,595.06	1892	29,951.74

L 14.

IMPROVEMENT OF INLAND WATERWAY BETWEEN NEW RIVER AND SWANSBORO, N. C.

This waterway, about 22 miles long (more fully described in the Annual Report of the Chief of Engineers, 1892, pp. 1146–1148), consisting of a sinuous and intricate channel winding through the marine marsh formed in the embayed area between the outlying barrier beach and the mainland, is for upwards of 7 miles 12 to 60 feet wide and 6 inches to 3 feet deep at low water.

The project, adopted in 1889, is to enlarge it by dredging to a minimum width of 40 feet and minimum depth of 4 feet at mean high water at an estimated total cost of $43,000.

In 1891 a railroad, 50 miles long, was put in operation from New River to Wilmington. Its extension from New River, 40 miles to Newbern, is now well advanced and the railroad will be in operation to Newbern this summer. Newbern is the center of an active and increasing fish and oyster trade, and this railroad will give a short and direct outlet for the oysters and fish from the somewhat extensive oyster beds and fisheries in New River and adjacent bays, and afford quick transit, so indispensable to those products, to Newbern and Norfolk.

The distance by this proposed waterway, continuing thence through Bogue Sound, Newport and Harlowe rivers, Clubfoot and Harlowe Canal, Clubfoot and Neuse rivers, from New River to Newbern, is 80 miles, and were the channel between New River and Swansboro to Bogue Sound enlarged, according to the project, transit by so circuitous a route would be slow and tedious in boats of light draft through narrow and shallow channels.

The railroad has therefore at least very much diminished, if it ha not destroyed, the usefulness which the proposed route would be as a outlet from New River, and it is not now apparent that there would b any considerable or regular navigation through it were it completed i accordance with the project. The water route from New River to Ne bern, though circuitous, might be of benefit in controlling freight rat by rail were not the principal products to be sent from New River fis and oysters, which must have quick transit.

Owing to the sinuosities of the channel through the marsh the di tance by sea parallel with this route is about 5 miles shorter. Fro New River, at its western extremity, to Bogue Inlet, near its easter extremity, the distance by sea is 15 miles, and between those two i lets there are two others through which vessels of light draft can see refuge in approaching storms.

The Wrightsville and Onslow Navigation Company having been i corporated with exclusive rights to the navigation of this waterway b an act of the general assembly of North Carolina of February 13, 188 work upon this improvement which, when this act became known t the engineer then in charge, had embraced only a survey sufficientl detailed to locate the necessary work and estimate its cost, has n since been resumed.

The foregoing act of the general assembly of North Carolina, t gether with a letter from the Chief of Engineers of November 24, 189 to the Secretary of War, were transmitted to Congress with a letter fro the Secretary of War of December 8, 1891, and will be found in Hou Ex. Doc. No. 26, Fifty-second Congress, first session, and also on 1147, Annual Report of the Chief of Engineers for 1892.

The waterway is in the collection district of Beaufort, N. C.

Money statement.

July 1, 1892, balance unexpended	$4,382.
July 1, 1893, balance unexpended	4,382.
Amount (estimated) required for completion of existing project. Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867.	38,000.

Inland waterway between New River and Swansboro.

Appropriated September 19, 1890	$5,000.
Expended fiscal year ending June 30, 1891	509.
Expended fiscal year ending June 30, 1892	133.
Freight transported, calendar year ending December 31, 1891 .... tons..	3,0

L 15.

IMPROVEMENT OF NEW RIVER, NORTH CAROLINA.

On the bar at the entrance to this river, which is shifting both depth and position, the depth is usually 5 feet at low water. The mea rise and fall of the tide at the inlet is about 2 feet and within the inl about 6 inches.

In 1882 a project was adopted to obtain a continuous channel with minimum depth of 5 feet at low water from the bar up 23 miles to Jac sonville, by deepening to 5 feet at its shoal places, widening to 150 feet, and straightening where it was somewhat crooked between beds of oyster rock, about 7,000 feet of channel around Cedar Bush Marsh, commencing about 1½ miles within the bar, at an estimated cost of $23,000, liable, it was then stated, to possible increase to $40,000 owing to the paucity of facilities in so isolated a situation.

In 1885 the project was changed to dredge a straight channel 4 feet deep at mean low water, 150 feet wide, and about 5,710 feet long through Cedar Bush Marsh, instead of improving the channel around it: also to dredge a channel of the same width and depth about 1,200 feet long through Wrights Island between the marsh and the bar around which there was a circuitous channel of sufficient width and depth for vessels that could cross the bar, at an estimated cost of $40,000.

To this date, June 30, 1893, $33,000 have been appropriated, and $32,442.35 expended.

The river is fully described and a summary of the work under this project given on pages 1149–1150 of the Annual Report of the Chief of Engineers for 1892.

In February, 1893, a survey was made by Assistant Engineer W. H. Chadbourn, jr., of the two channels that to March 21, 1888 (since which no work has been done) had been dredged to the depth of 4 feet, one through Cedar Bush Marsh about 5,800 feet long and 40 feet wide at bottom, and the other through Wrights Island 1,210 feet long to a width varying from 90 to 100 and 120 feet.

This survey shows (see two charts herewith) that the cut through Wrights Island has scoured to the depth of 7 to 16 feet and to the approximately uniform width of 100 feet, but that immediately above its upper end, where the strong ebb and flood currents through it encounter strong cross currents which set along the northerly shore of Wrights Island, a short shoal has formed across which not more than 3 feet can be carried, and that immediately below and in front of its lower end there is a bed of oyster rock upon which there is only 3 feet of water. The natural channel around this island has narrowed about one half and is apparently still narrowing.

The upper (northerly) part of the cut through Cedar Bush Marsh has shoaled for a distance of 1,700 feet, for 1,000 feet of which distance the average depth of water is 2½ feet, and for about 100 feet it is only 18 inches at low water. At the lower entrance to this cut and for about 100 feet the depth has shoaled to 3.2 feet.

As the width of 40 feet of the cut through Cedar Bush Marsh proved, during the time that the depth was sufficient, wide enough for the three small vessels that navigate this river, August 9, 1892, the project was modified to restrict the width of the two cuts to those then existing, 40 feet through Cedar Bush Marsh and 100 feet through Wrights Island.

In a special report submitted from this office March 11, 1893, the cost of dredging 10,000 cubic yards to restore the depth of 4 feet through the four shoals at the ends of the two cuts, and of regulating works, including 3,750 linear feet of embankment along the upper part of Cedar Bush Marsh cut, was estimated at $13,000.

Cedar Bush Marsh Cut and the channel below it are in a straight course 1½ miles long and southeasterly in direction. Above the shoal formed at the upper end of the cut for a third of a mile, the depth is only slightly (three-tenths to seven-tenths of a foot) in excess of 4 feet. The material of the cut is very fine sand, so liable to be moved by the flood current in spring tides or during strong southeasterly winds there is reason to expect that if the channel were redredged through the shoal and protected by embanking, a shoal would again form on the flat immediately above the end of the embankments entailing repeated redredging.

The restoration of the depth by dredging through the four shoals was therefore not recommended.

May 17, 1893, upon the recommendation of the Division Engineer, after an examination of the channel by him in person, the Chief of Engineers directed the district engineer to consider and report upon a project for improving the natural channel around the marsh and a alternative project of dredging a new and shorter cut in the line Dudleys Cut (see Coast Survey Chart No. 422) between the Cedar Bus Marsh Cut and the natural channel. The necessary surveys for th purpose will be made this summer.

In 1891 a railroad, 50 miles in length, was put in operation from W mington to New River. Its extension, 40 miles from New River Newbern, is well advanced and will be in operation in a few mont Until 1891, the only outlets from New River were by the river or carts over sandy roads. The most important product requiring tran portation is lumber, which is sawed chiefly at Jacksonville. Coastwi vessels of sufficiently light draft to cross the bar are so few in numb advantageous rates of freight for the transportation of lumber by the in large quantities can not be easily obtained, and nearly all the lu ber from New River would, therefore, be shipped by rail even were t channel around the marshes improved.

The products of next importance are oysters from the somewhat e tensive beds in the river and adjacent bays, and some fish, which mu be shipped by rail to obtain the quick transit which they need to Ne bern and Norfolk.

The products to be transported by river are, therefore, chiefly turpentine and rosin, agricultural products, and merchandise. The turpentine and rosin produced are small in quantity and decreasing from the depletion of the long-leaf pine; much of the neighboring country is not fertile, and the agricultural products are, and will be for a long time to come, small in quantity and value. The merchandise brought into the river is only that required in a sparsely settled region.

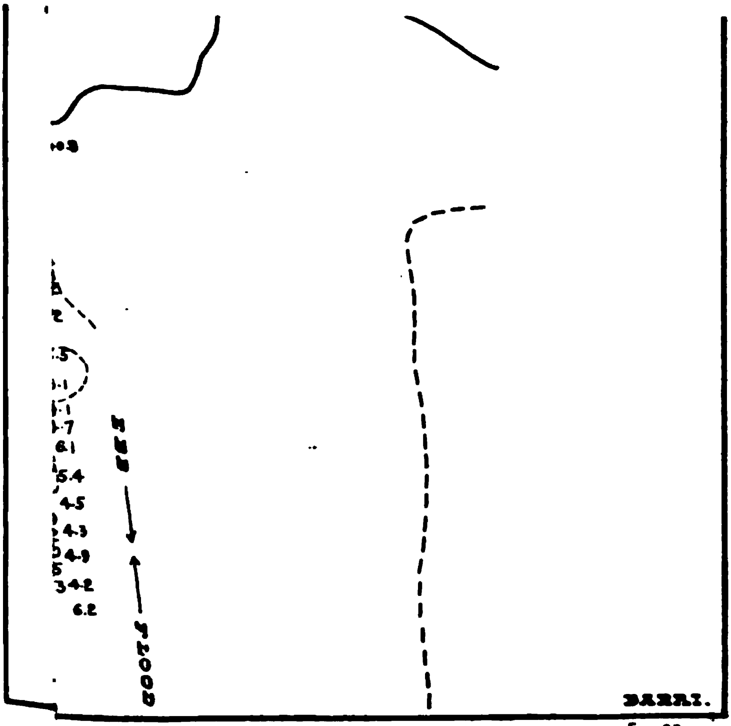
In 1882 seven schooners plied between Wilmington and New River, with an average tonnage of about 18 tons. Now there are but two and one sharpie.

The only obstacles which they find in navigating the natural channel around the marshes are two short shoals formed at the meeting of the current in the main channel with that from Chadwicks Bay. In working their way by kedge anchors over these shoals vessels are detained usually about three days.

Vessels touch to receive cargoes at five points on the 26 miles of river from the marshes up to Tar Landing, 6 miles above Jacksonville. The river is very broad and so shallow that at one of the foregoing points, Marines Landing, and in all other localities, freight has to be brought off even to the light-draft schooners in pole boats.

The contract entered into December 24, 1890, with the Alabama Dredging and Jetty Company for dredging to the amount of $5,500 to $6,500 in increasing the width of the cut at Cedar Bush Marsh to 100 feet, under which work had not commenced, was, by instructions from the Chief of Engineers of March 10, 1893, permitted to expire by limitation.

This river is in the collection district of Beaufort, N. C.



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Money statement.

July 1, 1892, balance unexpended	$8,221.85
Amount appropriated by act approved July 13, 1892	5,000.00
	13,221.85
June 30, 1893, amount expended during fiscal year	664.20
July 1, 1893, balance unexpended	12,557.65
Amount (estimated) required for completion of existing project	7,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867.

Freight transported.

Calendar year ending Dec. 31—	Tons.
1882	5,000
1890	17,359
1891	23,838

New River, North Carolina.

APPROPRIATED.

Date.	Amount.	Aggregate.
July 4, 1836, to July 7, 1838		$50,000
Aug. 2, 1882	5,000	5,000
July 5, 1884	5,000	10,000
Aug. 5, 1886	10,000	20,000
Aug. 11, 1888	3,090	23,000
Sept. 19, 1890	5,000	28,000
July 13, 1892	5,000	33,000

EXPENDED.

To June 30—		To June 30—	
1837 to 1839	*$48,833.54	1889	$18,532.49
1886	9,810.24	1890	19,188.18
1887	9,992.04	1891	19,688.03
1888	18,183.41	1892	19,780.15

* Balance of $1,166.46 turned over to surplus fund.

L 16.

IMPROVEMENT OF NORTHEAST (CAPE FEAR) RIVER, NORTH CAROLINA.

The project was adopted in 1889, and is to thoroughly clear a channel of good width and natural depth for small light-draft steamers up to Hallsville and for pole boats up to Kornegays Bridge by the removal of snags, stumps, fallen and overhanging trees, at an estimated cost of $30,000.

To June 30, 1893, $10,000 have been appropriated and $5,074.15 expended under this project.

To June 30, 1892, the channel and banks had been roughly cleared of the worst obstructions from Bannermans Bridge up 31½ miles to Chinquepin, and a wreck, together with a few snags, had been removed from the channel about 2½ miles above Wilmington.

During the fiscal year ending June 30, 1893, the channel and banks of 4¾ miles of the river, extending from Rafting Oar at the lower end of the most obstructed part up to a point 70½ miles above the mouth, have been cleared.

The plant belongs to the Upper Cape Fear River proper improvement, on which it has been used nearly all the year. Upon the completion of work on the Black River, where the plant is now at work, early in the ensuing fiscal year the hoister will be transferred to the Northeast Cape Fear River and kept at work there until the available balance is exhausted.

This river is paralleled by the Wilmington & Weldon Railroad at a distance of 2 to 11 miles. Up to Bannermans Bridge, 48 miles above its confluence with the main Cape Fear River at Wilmington, a draft of at least 6 feet can be carried at lowest stage, but the banks are almost continuously swampy and little is shipped from that part of the river except firewood by flatboats and logs in rafts.

From Bannermans Bridge 55 miles up to Kornegays Bridge the river is so shallow its navigation even by pole boats is not usually practicable for any periods of considerable continuous duration, but is dependent upon freshet stages, and therefore intermittent at all seasons of the year.

Flatboats of 30 to 50 tons capacity ascend the river to Kornegays Bridge, about 103 miles above Wilmington, carrying up merchandise and fertilizers and bringing down naval stores and some agricultural products. Many logs in rafts and considerable quantities of lumber and lumber products are also brought down. Tugboats of 8 tons capacity, drawing 3 feet, now tow these flatboats up the river to Bannermans Bridge at all times, and to Big Pitch Kettle, 54 miles above the mouth, where there is a rocky bar, at ordinary high lunar tides during low river stages.

Up to Coxs Bluffs, 70 miles above the mouth, where work was suspended in March last, there are only scattering snags in the channel; but from Coxs Bluffs to Kornegays Bridge the river is very much obstructed by snags and leaning trees.

The purpose of the improvement is to facilitate navigation by flatboats and to permit the small tugs to tow them up to Hallsville, but it is considered very doubtful if steamers carrying freight can be profitably or will be run upon the river.

It is estimated that $10,000 can be applied to this improvement during the fiscal year ending June 30, 1895, and that it will, with the present available balance, accomplish all that the traffic on the river demands.

The report of Mr. E. D. Thompson, assistant engineer in immediate charge of the improvement, is herewith transmitted.

The river is in the collection district of Wilmington, N. C.

Money statement.

July 1, 1892, balance unexpended	$1,191.79
Amount appropriated by act approved July 13, 1892	5,000.00
	6,191.79
June 30, 1893, amount expended during fiscal year	1,265.94
July 1, 1893, balance unexpended	4,925.85

Amount (estimated) required for completion of existing project	$20,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	10,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

REPORT OF MR. E. D. THOMPSON, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., June 30, 1893.

MAJOR: I have the honor to submit the following report on the improvement of the Cape Fear River, North Carolina (Northeast River), for the year ending June 30, 1893.

The work on this improvement commenced in January, 1891, under the project of 1889 and has continued at irregular intervals since then. Up to July 1, 1892, there had been removed altogether: From the channel, 215 trees, 209 logs, 129 stumps, 8 large snags, 90 cords of small snags, and parts of an old steamboat, scow, and boats, and from the banks 216 trees had been cut and hauled back, and 145 cords of brush cut, leaving at that time between Smiths Creek and Hilton Bridge, 2 miles above Wilmington, a channel one-half mile long with a least width of 350 feet and 6 feet depth at low water, and from Bannermans Bridge, 48 miles above Wilmington 31 miles to Chinquepin, N. C., a channel had been roughly cleared of its worst obstructions to an ordinary high-water navigation.

Eight gauges had been established on the river and the readings of seven of these continued from December, 1890, to the beginning of the present fiscal year, the one at Bannermans Bridge having been discontinued August 1, 1891.

Under the appropriation of July, 1892, active snagging operations were resumed February 7, 1893, with plant borrowed from the improvement of Cape Fear River, North Carolina, above Wilmington, and continued until February 27, when the work was temporarily discontinued, the plant being needed for more pressing work on Black River, North Carolina.

During that period the river was snagged from Rafting Oar at the upper end of Horse Shoe Cut (65¾ miles above Wilmington) 4¾ miles up to a point just above Coxs Bluff leaving a cleared channel the entire distance with a least width of 40 feet and natural depth not exceeding 2 feet at low water.

From the channel 25 trees, 64 large snags, 15 stumps, 20 cords small snags, and 54 logs were removed, and from the banks 73 leaning trees were cut and hauled back, and 2 cords of brush were cut and 7 logs removed.

Seven gauges were maintained from July 1 to January 1 at the following points, viz. Kornegays Bridge, Sarecta, Hallsville, Chinquepin, Deep Bottom Bridge, Crooms Bridge, and Castle Hayne.

On January 1, 1893, a continuous water-gauge record had been obtained at the several localities for two years and regular readings were discontinued. The gauge at Chinquepin was afterwards maintained as a working gauge until April 1, at which date it also was discontinued for the present.

A general inspection was made in February, 1893, of the entire river from Kornegays Bridge to Wilmington, 103 miles. This inspection showed that with thorough snagging the river can be made navigable at moderate cost for small stern-wheel boats as far as Chinquepin, 79 miles above Wilmington, and at a considerable increased cost per mile 10 miles farther to Hallsville, giving a depth of 3 feet at ordinary stages.

From Hallsville, 14 miles to Kornegays Bridge, the river is so narrow and shallow and crooked that it is doubtful if there is room for the United States plant to work, unless it be in time of freshet.

The funds now on hand can probably be most economically expended in snagging below Chinquepin. The river is still quite badly obstructed above Rafting Oar; between that point and Bannermans Bridge some troublesome snags are reported, while below Bannermans Bridge there are a few isolated ones which a week's work would remove.

The part of the river under improvement is crossed by nine bridges, the data o which are given in the following table:

Locality.	Description.	Clear bay of draw.	Width of raft.	Height of span above zero of gauge.	Water in 1891- above zero of gauge.	
					Highest.	Lowe
		Feet.	*Feet.*	*Feet.*	*Feet.*	*Fee*
Castle Hayne	Iron (Wilmington and Western R. R.).	63	....	....	5	1
Bannermans	Wood (county)	29.6	35	14.1	6.6	....
Crooms	do	22.7	65	20.1	17.1	1
Deep Bottom	do	None.	37.5	21	16.9	1
Chinquepin	do	None.	33.5	16	14.5	1
Hallsville	do	None.	32.5	14.5	13.2	4
New Bridge	Wood (neighborhood)	None.	31	12.9	(*)	(*)
Sarecta	Wood (county)	None.	27.5	8.9	7.8	
Kornegays	do	None.	19	7.5	7.8	

* No observations.

The U. S. S. *Wright* is 26 feet beam, and the hoister now under construction (the Northeast, Cape Fear, and Black rivers, North Carolina) will be 24 feet wide.

Under present conditions the *Wright* can, by lowering the smokestack, go up high as Chinquepin when the gauge at Crooms Bridge does not read over 7 feet, passing through the raft span of that bridge and the one at Deep Bottom. The sa is true of the hoister, if the "A" frame be lowered. Above Chinquepin neither b can go without taking down a full span of each bridge to be passed. This is b expensive to the United States and ruinous to the bridges. All bridges should furnished with drawspans of a minimum width of 30 feet in the clear, and u such spans are provided for the free use of navigation the expenditure of Unit States funds for the improvement of the portions of the river obstructed by t bridges is of doubtful utility, particularly above Chinquepin.

The steamboats now running on the river are small tugs, narrow, low on the wat and with short stacks. On fair water they tow pole boats as high as Chinquepin.

The expenses of the year have been—

For snagging	$1, 226.

Distributed as follows:

General superintendence	178.
Gauges	225.
Expenses of hoister—crew, $283.07; towing, $322.67	705
Repairs to plant	5
Purchase of plant	6
Total	1, 22

Cost per mile of work for—

Actual snagging	8
Snagging, including towing	14
All expenses	25

It is estimated that it will cost to thoroughly snag the river—

From Bannermans Bridge to Chinquepin, 31¼ miles	6
From Chinquepin to Hallsville, 9¼ miles	2
From Hallsville to Kornegays Bridge, 14 miles	4
Total	12

these figures (including plant and all other expenses) being based on this sea work on this and Black rivers and assuming that the work can all be done tinuously. A single appropriation of $10,000 in addition to the funds on hand sh be sufficient to secure a good channel of 40 feet width and natural depth not excee 2 feet at low water from Kornegays Bridge down to deep water below Banner Bridge.

Value of United States plant is $156.30.

Very respectfully, your obedient servant,

E. D. THOMPSON,
U. S. Assistant Engine

Maj. W. S. STANTON,
Corps of Engineers, U. S. A.

COMMERCIAL STATISTICS.

The commerce for the year ending December 31, 1892, is estimated as follows:

Class of goods.	Tons.	Class of goods.	Tons.
Cotton	85	Tar	733
Cotton seed, meal, and oil	100	Turpentine, crude and spirits of, and rosin	2,380
Tobacco	5	Lumber and its products	29,651
Rice	81	Fertilizers	100
Grains	255	General merchandise	553
Vegetables, including truck	132	Coal and minerals	3,220
Live stock, including poultry	12		
Meats and their products	138		
Fish and shell-fish	25	Total	37,429

Gain over last year 7,134 tons.
Transportation lines established during year, none.

Freight transported.

Calendar year ending Dec. 31—	Tons.
1890	40,596
1891	30,295

Northeast (Cape Fear) River.

APPROPRIATED.

Sept. 19, 1890	$5,000.00
July 13, 1892	5,000.00

EXPENDED.

To June 30—	
1891	$3,173.60
1892	3,843.71

L 17.

IMPROVEMENT OF BLACK RIVER, NORTH CAROLINA.

This river, which flows into the Cape Fear River 14½ miles above Wilmington, was described and the history of its improvement by an incorporated company and by the United States was given on pages 1154–1157 of the Annual Report of the Chief of Engineers for 1892.

The project approved in 1885 is to apply at least $10,000 to removing logs, snags, and overhanging trees from the bed and banks of the river and rounding off a few of the sharper bends from its confluence with the Cape Fear River up 86 miles to Lisbon.

May, 1893, by authority from the Chief of Engineers, the project was modified to exclude the 7 miles of river above Clear Run Bridge, and to remove logs, snags, and overhanging trees from the bed and banks of the river and to round off such of the sharper bends as may seriously impede navigation from the mouth of the river up to Clear Run Bridge, at a cost not to exceed the total sum of $13,000 already appropriated, and that the balance available remaining after so clearing the channel and banks be applied to the removal of such obstructions as may be thereafter formed in the channel or on the banks.

To June 30, 1893, $13,000 have been appropriated and $7,874.57 expended upon this improvement.

During the fiscal year ending June 30, 1893, the clearing of the river and banks, which commenced in March at Clear Run, has embraced 15 miles, extending from that point down to the sixtieth milepost above the confluence.

On the straight reaches the snags have been removed for a width of 40 feet, in the narrow bends for the full natural channel width, and in the wide bends to a width necessary to make a practicable channel in turning, the depth of channel cleared in the pools being restricted to the depth on the bars, with an allowance of 1 foot for a margin of safety.

The channel so cleared has proved entirely practicable for the steamboats now navigating the river and satisfactory to those who own and control them.

The amount now available will be applied to clearing the channel through all the obstructions. For its maintenance until June 30, 1895, $3,000 should be appropriated.

There is a very active traffic in naval stores and farm products, poultry, eggs, etc., on this river and a considerable traffic in lumber, shingles, and juniper bolts, besides logs, which are rafted down in considerable quantities.

Up to Point Caswell, 24 miles above its confluence with the Cape Fear River, a draft of 4 feet can be carried at low stage. In the 28 miles next above Point Caswell there are three localities, known as Goffs, Haws, and South River (or Beattys) Narrows, the former 2 miles and the two latter each 4 miles in length, where the natural channel is very narrow, crooked, and shallow, the water spreading laterally through cypress swamps.

The clearing of the river has not yet descended to the uppermost of these shoals, and the removal of the snags and logs from them, against which sand is collected forming bars, may result in a sufficient increase in depth; if not, should the commerce of this river continue to increase, it may be expedient to apply a further sum of $10,000 to $15,000 to closing outlets by dikes and rounding off sharp bends in these now shallow narrows. Sometime after the work now in progress has been completed a recommendation regarding this can be better submitted.

This river is paralleled by the Cape Fear and Yadkin Valley Railroad at a distance of 2 to 4 miles, but the traffic of places about equally near the railroad and river is chiefly by the river at freight rates lower than by rail.

This river is in the collection district of Wilmington, N. C.

Money statement.

Amount appropriated by act approved July 13, 1892	$10,000.
June 30, 1893, amount expended during fiscal year	3,543.
July 1, 1893, balance unexpended	6,456.
July 1, 1893, outstanding liabilities	1,330.
July 1, 1893, balance available	5,125.
Amount that can be profitably expended in fiscal year ending June 30, 1895, for maintenance	3,000.
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

REPORT OF MR. E. D. THOMPSON, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., June 30, 1893.

OR: I have the honor to submit the following report on the improvement of River, North Carolina, for the fiscal year ending June 30, 1893.

k by the United States was first commenced on this river in October, 1887, to July 1, 1892, there had been removed altogether from the channel 275 3 stumps, and 9¾ cords small snags; from the banks, 472 overhanging trees cords brush; 40 overhanging trees were trimmed. This work gave a roughly channel from Point Caswell, 21½ miles above the confluence with the Upper ear River, 42 miles to Clear Run.

r the appropriation of July, 1892, work was commenced March 7, 1893, with orrowed from the improvement of Cape Fear River, N. C., above Wilmington, till in progress.

oister was towed to Clear Run Bridge, 63½ miles above the confluence, by the and has since cleared the river from that point down 18 miles to Roberson's g, leaving a channel everywhere of 40 feet minimum width in straight reaches, atural channel width in narrow bends and in wide bends to the full width be- he contours lying at the depth to which the snagging was carried, viz: 2 feet be- of the Clear Run gauge between Clear Run and Corbetts or Union Bridge. ls on which the natural channel depth was less than 1.8 feet at low water s above the river bed were first removed and then all embedded snags were ut, so as to attain a minimum depth of 1.8 feet upon such shoals.

e hoister moved down stream the banks were cleared of all overhanging gs, and other obstructions, the bank work being kept slightly in advance of nnel work.

ork done to date by the hoister has been the removal from 18 miles of 283 706 logs, 492 large snags, 317 trees, 109½ cords small snags, and 2 sunken m the channel; and 614 overhanging trees were pulled back, 53 logs rolled 5 trees trimmed, and 349¾ cords of small brush cut from the banks. The cleared still contains one or two located snags which could not be removed hoister at the time on account of high water or other causes; these will lly be destroyed by dynamite.

ne 1 the steamer *Wright*, having been fitted up with a hoisting engine, was ork at Point Caswell to clear banks of obstructions from that point up- To date the work done has been 378 overhanging trees pulled back, 6 trees , 13 cords of small brush cut, and 101 of the worst channel obstructions t between that point and Sparkleberry Landing, 4 miles above, and from ty and one-half mile post at the head of Haws Narrows down 1½ miles to nty-ninth mile post.

eral inspection of the river from Lisbon to Wilmington was made in February. pection showed that from the confluence, 63½ miles, to Clear Run, the present navigation, the river can easily be made navigable for small steamboats by snagging, giving a minimum depth of 2 feet at low water. Between n and Lisbon, 7 miles, the river is very crooked and badly obstructed.

ndition of the river at present is approximately as follows:

the confluence to Point Caswell, 21½ miles, there is 4 to 6 feet of water at all xcepting on a short shoal near the Thoroughfare, about 2 miles below Point which carries 1.5 feet at dead low water. The rise of tide at this shoal is 2 hat its high-water depth is 3.5 feet. From Point Caswell 8 miles to Haws Nar- re is an average low-water depth on the shoals of 18 inches; thence 15¾ miles of work of the hoister there is 2 feet at dead low water; thence 18 miles to n there is fully 2 feet depth on all shoals, where previous to the snagging re not at times more than 15 to 18 inches, the worst being that at Big Bend feet.

6 miles next below Point Caswell there are a few isolated snags. Between swell and Haws Narrows, 8 miles, there are a few trees in the channel; in arrows for a distance of 1 mile there are numerous shoals and sunken logs river is crooked and narrow. Between Haws Narrows and South River, 8 here is comparatively little work to do; from thence, 6¾ miles to place of e river is still badly obstructed; from the place of work 18 miles to Clear re is a snagged channel with a minimum width of 40 feet and a minimum 2 feet.

ver is crossed by bridges with draws at the following places, viz: Point Cas- attys, Ivanhoe, Cape Fear and Yadkin Valley Railroad crossing, Newkirks r Run. Of these Union Bridge at Ivanhoe has a draw span of less than 26 th, and the span of the Clear Run Bridge is 24½ feet wide. At Newkirks span has a clearance of 26½ feet. In passing these bridges parts of those at Ivanhoe and Newkirks were taken down twice in order to allow the United States plant to pass. All these bridges should have not less than 30 feet clear draw span. In their present condition they obstruct navigation and make the passage of the United States plant up and down the river unnecessarily expensive.

The funds on hand are probably sufficient to snag the remainder of the river for a width of 40 feet and low-water depth of 2 feet to deep water below Point Caswell. Such a channel is the minimum sufficient for the present needs of navigation. In the narrows cut-offs avoiding short, quick turns can in many instances be advantageously made, while many shoals, especially in Haws Narrows, can be improved either by dredging or by diking the outlet sloughs and preventing the water from wasting through the swamps, as at present. There are also numerous short bends that should be rounded off. This work has been previously estimated to cost $15,000 and if undertaken will require a further appropriation of that amount.

The value of the plant is estimated at $361.87.

A new hoister has been under construction for the work on this and neighboring rivers, but has not yet been entirely completed. Its cost to date, chargeable to Black River, has been $997.50.

The expenditures of the year have been as follows:

For channel snagging	$3,283.
For bank trimming	1,094.
Total	4,378.
Distributed as follows:	
Superintendence	540.
Operating hoister	2,355.
Towing	120.
Purchase and construction of plant	1,362.
Total	4,378.
Number of miles snagged	2
Number of miles bank trimmed	2
Cost of snagging per mile (all expenses except construction of hoister)	$107.
Cost of bank trimming per mile (all expenses except construction of hoister)	26.
Cost per mile of operating hoister:	
Snagging	100.
Trimming	25.

A list of the steam vessels plying on this river is appended to this report.

Snagging operations have been under the direct supervision of Mr. D. S. Bender, overseer, to whom thanks are due for the efficient work done.

Very respectfully, your obedient servant,

E. D. THOMPSON,
U. S. Assistant Engineer.

Maj. W. S. STANTON,
Corps of Engineers, U. S. A.

COMMERCIAL STATISTICS.

List of vessels plying on Black River, North Carolina, during the fiscal year ending June 30, 1893.

Name of vessel.	Net tonnage.	Remarks.
Lisbon	66.94	Semiweekly trips between Wilmington and Clear Run.
W. T. Daggett	50.57	Semiweekly trips, Wilmington to Point Caswell, to November, 1892.
A. P. Hurt	140.11	Annex boad to steamer Lisbon during low water, running between Wilmington and Long View.
C. F. D	4.00	Irregular trips; towing flats, rafts, etc.
Pet	5.00	
F. and F	9.10	

The commerce for the year ending December 31, 1892, is estimated as follows:—

Class of goods.	Tons.	Class of goods.	Tons.
Cotton	78	Tar	1,260
Cotton seed, meal and oil	12	Turpentine, crude, and spirits of, and rosin	17,273
Tobacco	34	Lumber and its products	32,800
Rice	106	Fertilizers	350
Grains	345	General merchandise	3,259
Vegetables, including truck	128	Coal and minerals	30
Live stock, including poultry	98		
Meats and their products	251		
Fish and shellfish	27	Total	56,051

Decrease since last year 23,378 tons.
Transportation lines established during year, none.

Freight transported.

Calendar year ending December 31—	Tons.
1889	48,650
1890	61,311
1891	79,429

Black River, North Carolina.

APPROPRIATED.

Date.	Amount.	Aggregate.
August 5, 1886	$3,000	$3,000
July 13, 1892	10,000	13,000

EXPENDED.

To June 30—		To June 30—	
1887	$42.70	1890	$2,896.85
1888	2,267.31	1891	2,997.40
1889	2,377.24	1892	3,000.00

L 18.

IMPROVEMENT OF CAPE FEAR RIVER ABOVE WILMINGTON, N. C.

The river above Wilmington is 115 miles in length to Fayetteville; the practical head of navigation 149 miles above the mouth.

The project of 1881, as matured in 1885 and 1886, is to secure "at all times of the year" a depth of 4 feet from Wilmington 73 miles to Elizabethtown, and of 3 feet thence 42 miles to Fayettville, by the removal of snags, logs, stumps, and rock, and of overhanging trees from the banks, by the building of 84,000 linear feet of rock jetties and by a small amount of dredging, at a total cost estimated in 1893 at $275,000.

A description of the river and brief summary of the work done upon it are given on pages 1158–1161 of the Annual Report of the Chief of Engineers for 1892.

To June 30, 1893, $118,250 have been appropriated and $112,330.20 expended under the project.

The natural channel depth at lowest stages permits boats drawing 4 feet to ascend to the lowest shoal at Browns Reach 50 miles above Wilmington.

Except occasional snagging below that reach the improvement pertains exclusively to the 65 miles from Browns Reach up to Fayetteville, in which distance there are 43 shoals of sand aggregating 16¾ miles in length, being 26 per cent of the 65 miles. Fifteen of these shoals, having a total length of 3.4 miles, are in the 23 miles between Browns Reach and Elizabethtown, and 28 of them, having a total length of 13.3 miles, are in the 42 miles between Elizabethtown and Fayetteville.

Above Elizabethtown the shoals occupy 32 per cent, and below it 15 per cent of the channel length.

The least channel depth at low stages above Elizabethtown is now 1.2 feet (on Old Ferry Shoal) and below Elizabethtown 2.6 feet (on Little Sugar Loaf Shoal).

At extreme low summer stage and spring tides there is said, by a close observer long familiar with the river, to be a flood current at Browns Reach, the lower extremity of the shoals; a rise of tide of about 10 inches at Whitehall, 5 miles above, and that Cypress Shoal, 14 miles above the lower extremity of the shoals and 97½ miles above the mouth of the river, is the highest point at which the tide is sometimes perceptible.

Work continued with the hoister and U. S. S. *H. G. Wright* from July 1, 1892 until January 31, 1893, when it was interrupted (until March 7) by ice and high water, and the hoister was transferred to the Northeast Cape Fear River. March 13 the *H. G. Wright* returned to the river and was employed first in adding stones to the jetties, afterwards continuing upon the survey of the shoals until its completion about May 31.

During the year 33 new jetties of brush and stone aggregating 3,619 feet in length were built on five of the worst shoals on the river at and above Elizabethtown; 740 linear feet of old jetty were raised, and 100 linear feet of old log jetty riprapped, with 419 tons of stone; 13 miles of channel were cleared of snags; and all the shoals were surveyed, embracing, with the upper parts of the pools to sufficient depth to receive the sand to be scoured from the bars, 28.7 miles of hydrography.

The jetties, 28 in number and aggregating 3,469 linear feet, built during the year on three of the shoals, formerly the worst on the river, namely, Elizabethtown, Morehead, and Thames, having a total channel length of 2.4 miles, have completed the improvement of those shoals, and there is now a channel depth of 3 feet across them at lowest stages.

The jetties have been built of mattresses made of brush cut on the banks, and of stone in part (1,086 tons) collected on the banks in the past few years and in part (2,457 tons of sandstone) purchased by poster and circular letter without formal contract, first at $1.34 and latterly at $1.30 per 2,240 pounds, delivered on the river bank at Fayetteville. The mattresses were built on inclined skids on a scow from which they were launched directly into their place in the jetty.

That the mattresses, which are so inexpensive and soon become permeated with sand, might form as large a part of the jetties as consistent with durability their thickness was designed to come up to the level of low water.

The aim has also been to keep the jetties low to avoid the use of unnecessary quantities of stone, producing unnecessary depth of scour and re-forming the shoal below. Their height has varied according to the depth of scour to be obtained, from 1½ to 4 feet, and averaged about 2 feet. Where they fail to cause sufficient scour their height can be easily increased by merely throwing on more stone, an advantage not afforded by the sheet-pile jetties. Their length is about three-fifths of the width of the river. They have been placed about 300 feet apart ting the river. During the extreme low water all heavy freight between eville and Browns Reach, 65 miles, was carried on large light-draft flats in the steamers. From the latter place to Wilmington there is an abundance of it all stages.

nuary and February, 1893, navigation was entirely suspended for three weeks unt of ice.

United States plant in use consists of the steamer *H. G. Wright* and one steam . There are no flats or scows belonging to the improvement; those in use the year were borrowed from the improvement of the Cape Fear River, North a, at and below Wilmington. The *Wright* has been fitted with a new cabin its present condition is fairly well adapted for the work. The boat will a new hull before being used for work under another appropriation; the nd machinery are in good condition. The hull of the hoister is much out of and nearly unserviceable. The machinery is good and will, after July 1, be d to a new scow (now under construction).

value of the plant is estimated at $4,640.74.

t of the steam vessels plying over this river is appended to this report.

xpenditures of the year have been—

gging in river	$1,019.78
ty work	11,583.64
'otal	12,603.42
ibuted as follows:	
l superintendence	957.95
s	1,768.22
including repairs	751.11
l work	9,126.14
'otal	12,603.42
r linear foot of jetty—	
tual construction	2.07
expenses except surveys for future work	2.51
pairs	.87
snagging per mile	78.44

work of the past year has very materially aided navigation. Since the complet jetties at Elizabethtown, Morehead, and Thames Shoals, formerly the worst n the river, no trouble has been experienced at these places. A channel 3 feet as maintained through each of these shoals during the lowest stages of the The worst remaining shoals are Old Ferry, Waddells Ferry, Little Sugar Loaf, e, Cypress, Purdies to Melvins, the Dodge, Windom, and Callahan, aggregating 'eet in length. Of these only Old Ferry has been partially improved.

ondition of the river is approximately as follows: 4 feet can be carried in a l 100 feet wide from Wilmington 50 miles to Brown's Reach at all stages; 23 miles to Elizabethtown there are 15 shoals aggregating 17,830 feet in length, st low-water channel depth being 2.6 feet on Little Sugar Loaf Shoal; thence s to Fayettsville there are 28 shoals aggregating 53,150 feet in length, the w-water depth being 1.2 feet on Old Ferry Shoal. From Browns Reach to eville the channel varies in width from 100 to 80 feet. The river is not now at ce badly obstructed by snags.

re appropriations can be best expended in continuing jetty and snagging work vorst shoals; and for the economical prosecution of work, the amount of funds be such that work can be pushed at low stages of the river.

ty thousand dollars can be profitably expended yearly on this river until the is completed. Its maintenance afterwards may require from $1,000 to $3,000 ly.

ks are due Messrs. W. A. Kinyon, in charge of the *Wright* and of surveys, and nder, in charge of snagging and jetty construction, for the very efficient s rendered.

'ery respectfully, your obedient servant,

E. D. Thompson,
U. S. Assistant Engineer.

W. S. Stanton,
'orps of Engineers, U. S. A.

REPORT OF MR. E. D. THOMPSON, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFI
Wilmington, N. C., June

MAJOR: I have the honor to submit the following report on the impr
the Cape Fear River, North Carolina, above Wilmington, for the fiscal y
July 1, 1893.

Work on this river was begun by the United States on June 10, 1882
that date to June 30, 1892, there had been removed altogether 33,144 s
trees, and stumps from the channel and banks. Jetties had been built
shoals; those standing July 1, 1892, were by measurement as follows:

Name of shoal.	Sheet pile.		Log and brush.		Rock and rock and brush.	
	No.	Length.	No.	Length.	No.	Length.
		Feet.		*Feet.*		*Feet.*
Fayetteville and McCarters Cross	14	1,477	2	242	10	1,220
Old Jetties	4	525	1	120	5	518
McRaes	1	103	....	....	3	335
Smiths Cross (Old Ferry)	1	136	2	201	....	....
Thames	....	....	....	....	7	750
Morehead	....	....	....	....	7	776
Elizabethtown	1	55	1	100	....	....
Cypress	....	....	1	50	....	....
Total	21	2,290	7	713	32	3,599

Of these, many of the sheet-pile jetties were badly broken, and nearly
more or less repairs to put them in good condition; 1,860 cubic yards o
been quarried and deposited at various places along the river bank for
work.

The operations of the fiscal year have been especially directed to the im
of the worst shoals on the river, and the collection of accurate data for
improvement of the stream. All work was in progress July 1, 1892, and
without intermission until January 31, 1893.

The rock and brush jetties built during that time are shown in the
table, the shoals being arranged in the same order as worked on.

Jetties built from July 1, 1892, to January 31, 1893.

Name of shoal.	Distance below Fayetteville.	Jetties built.		Mate
		No.	Length.	Rock
	Miles.		*Feet.*	*Tons*
Elizabethtown	42	4	442	1,2
Morehead	36½	9	1,055	6
Thames	13	15	1,762	1,0
McCarters Cross	1	3	210	
Old Jetties	2½	2	150	1
Total	....	33	3,619	3,1

Cords of brush used per linear foot equals 0.35.
Tons of rock used per linear foot equals 0.86.

These jetties were built in 2 feet average depth of water, rose from
(average 2 feet) above low water, and extended about three-fifths of t
across the river, leaving a channel way varying from 80 to 100 feet w
foundations were brush mattresses of such thickness that after bein
place and ballasted the upper surfaces of the mattresses were just bel
of dead low water. A feature of the mattresses was two longitudinal
cines, 10 to 12 inches in diameter, placed 7 feet apart and equidistan
axes of the mattresses as stringers. In the space between these st
ballast for sinking the mat was placed, leaving a clear brush berm of 5½ f
side. Stone was added to the ballast from time to time according to the
scour developed. The base of the stone superstructure being limited to

vented loss of stone, which was piled in a ridge as steep as it would stand; the larger and heavier ones were placed on such jetties as were particularly exposed to strong current action, as those at crossings, and on the channel ends of all others. At Thames Shoal 830 tons of clay and hardpan picked up on the banks were sacked and used for sinking mats. As a temporary expedient it proved very successful, stone being difficult to obtain at the time on account of the low stage of the river.

In addition to the above new work, six jetties (740 linear feet) at McCarters Cross were, in March, 1893, raised to 3 feet at low water, and 1 log jetty (100 linear feet) at Elizabethtown was, in July, 1892, riprapped by the use of, respectively, 239 and 180 tons of stone.

Of the 3,543 tons of stone used during the year, 2,457 tons were furnished by the Carolina Brown Stone Company, of Sanford, N. C., up to March 1, 1893, at $1.34, and after that date at $1.30 per ton of 2,240 pounds, delivered in carload lots on the river bank at Fayetteville, and 1,086 tons were picked up from the river bank near places of work where it had been deposited in former years by United States labor. The stone from Sanford was loaded on United States scows at Fayetteville at an additional cost of 16 cents to the contract price, and then towed to the various shoals by the steamer *Wright*. All brush was cut from the banks in the vicinity of the jetties where it was used.

At various times when jetty construction could not be favorably prosecuted the river was snagged from 64¼ to 65 miles, 73 to 81 miles, 102 to 105 miles, and 112½ to 114 miles above Wilmington; total, 13 miles. Forty trees, 72 stumps, 153 logs, 218 large snags, and 66 cords small snags were removed from the river channels. Both Little Sugar Loaf and McDowells Barn shoals (mentioned in the last report as badly obstructed) were included in the above snagging. Work was temporarily suspended on account of high water and ice from January 31 to March 7, and then resumed to repair the six jetties at McCarters Cross, and make surveys of all the shoals on the river as the basis of an estimate for future work. In the 65 miles between Browns Reach, 50 miles above Wilmington and Fayetteville there are forty-three shoals, all of which have been at various times more or less troublesome to navigation.

Of these, those at Fayetteville, Old Jetties, McRaes, Old Ferry, Morehead, Thames, Elizabethtown, and Cypress had been more or less improved. During the year surveys have been secured of all these shoals, and those where there are jetties have been surveyed twice. Most of the work was done during low-water stages of the river by Mr. Kinyon, captain of the *Wright*, with the crew of the boat. The surveys were based on compass and chain base lines on the banks and stadia distances across the river; soundings were taken at intervals of 10 to 20 feet in lines 50 to 100 feet apart and located by a cord stretched between stadia stakes and tagged at equidistant intervals. The method is simple, rapid, and accurate, and for rivers not over 400 feet in width gives excellent results. One hundred and fifty-one thousand feet of base line marked with permanent branded stakes were run in this way at an actual cost of $1,768.92. The soundings of all these surveys are referred to the low water of 1892, viz, 0.8 foot above zero on Fayetteville gauge and 1.3 feet below zero on Elizabethtown gauge as datums.

These gauges are the standard ones of the river, located 42 miles apart, and have been read daily throughout the year. These surveys have usually shown deep pools below the shoals sufficient in extent to receive all scour. In this respect, as well as in the loose and sandy nature of its bottom, the river is particularly adapted to improvement by jetties. It is believed that the style of jetty adopted for the past season's work, being both cheap as to materials, easily constructed, and quick in results, is far superior to the sheet-pile and log jetties of the type shown on the Fayetteville shoals. The following table is a complete list of all shoals on the river on June 1, 1893, carrying less than 4 feet at low water from Wilmington as far as Elizabethtown and less than 3 feet above that point on to Fayetteville. An estimate of the number and aggregate length of jetties yet to be built at each shoal to finish the present project is also given.

This estimate is based on the assumption that the beneficial effects of jetties similar to those constructed this season extend a distance of 300 feet below them; that brush should enter into their construction as largely as possible, and that no more rock should be used at any shoal than just sufficient to secure and hold the required scour.

The jetties are designed to secure between Browns Reach and Elizabethtown and from there to Fayetteville minimum channel widths of respectively 100 feet and 80 feet.

navigating the river. During the extreme low water all heavy freight between Fayetteville and Browns Reach, 65 miles, was carried on large light-draft flats in tow of the steamers. From the latter place to Wilmington there is an abundance of water at all stages.

In January and February, 1893, navigation was entirely suspended for three weeks on account of ice.

The United States plant in use consists of the steamer *H. G. Wright* and one steam hoister. There are no flats or scows belonging to the improvement; those in use during the year were borrowed from the improvement of the Cape Fear River, North Carolina, at and below Wilmington. The *Wright* has been fitted with a new cabin and in its present condition is fairly well adapted for the work. The boat will require a new hull before being used for work under another appropriation; the boiler and machinery are in good condition. The hull of the hoister is much out of repair and nearly unserviceable. The machinery is good and will, after July 1, be removed to a new scow (now under construction).

The value of the plant is estimated at $4,640.74.

A list of the steam vessels plying over this river is appended to this report.

The expenditures of the year have been—

For snagging in river	$1,019.78
For jetty work	11,583.64
Total	12,603.42

Distributed as follows:

General superintendence	957.95
Surveys	1,768.22
Plant, including repairs	751.11
General work	9,126.14
Total	12,603.42
Cost per linear foot of jetty—	
Actual construction	2.07
All expenses except surveys for future work	2.51
Repairs	.87
Cost of snagging per mile	78.44

The work of the past year has very materially aided navigation. Since the completion of jetties at Elizabethtown, Morehead, and Thames Shoals, formerly the worst places on the river, no trouble has been experienced at these places. A channel 3 feet deep was maintained through each of these shoals during the lowest stages of the river. The worst remaining shoals are Old Ferry, Waddells Ferry, Little Sugar Loaf, Horseshoe, Cypress, Purdies to Melvins, the Dodge, Windom, and Callahan, aggregating 16.[illegible] feet in length. Of these only Old Ferry has been partially improved.

The condition of the river is approximately as follows: 4 feet can be carried in a channel 100 feet wide from Wilmington 50 miles to Brown's Reach at all stages; thence 23 miles to Elizabethtown there are 15 shoals aggregating 17,830 feet in length, the least low-water channel depth being 2.6 feet on Little Sugar Loaf Shoal; thence 42 miles to Fayettsville there are 28 shoals aggregating 53,150 feet in length, the least low-water depth being 1.2 feet on Old Ferry Shoal. From Browns Reach to Fayetteville the channel varies in width from 100 to 80 feet. The river is not now at any place badly obstructed by snags.

Future appropriations can be best expended in continuing jetty and snagging work at the worst shoals; and for the economical prosecution of work, the amount of funds should be such that work can be pushed at low stages of the river.

Twenty thousand dollars can be profitably expended yearly on this river until the project is completed. Its maintenance afterwards may require from $1,000 to $3,000 annually.

Thanks are due Messrs. W. A. Kinyon, in charge of the *Wright* and of surveys, and D. S. Bender, in charge of snagging and jetty construction, for the very efficient services rendered.

Very respectfully, your obedient servant,

E. D. THOMPSON,
U. S. Assistant Engineer.

Maj. W. S. STANTON,
Corps of Engineers, U. S. A.

COMMERCIAL STATISTICS.

List of steam vessels plying on the Cape Fear River, North Carolina, above Wilmington, for fiscal year ending June 30, 1893.

Name of vessel.	Net tonnage.	Remarks.
D. Murchison	140.72	Regular steamers plying between Wilmington and Fayettevill. Four trips per week.
A. P. Hurt	140.11	
Cape Fear	156.32	
Lisbon	66.94	Annex boat to regular steamers between Brown's Reach and F etteville during low-water stages.
Compton	53.94	Towing between Wilmington, N. C., and Navassa.
C. Killam	6.66	
F. & F	9.10	Irregular towing for rafts, flats, etc.
C. F. D	4.00	
Wilmington	110.09	Irregular trips between Wilmington, N. C., and Piney Bluff.

The commerce for the year ending December 31, 1892, is estimated as follows:

Class of goods.	Tons.	Class of goods.	Tons.
Cotton	757	Tar	2,
Cotton seed, meal and oil	140	Turpentine, crude and spirits of, and rosin	6,
Tobacco	28	Lumber and its products	49,
Rice	347	Fertilizers	8,
Grains	805	General merchandise	8,
Vegetables, including truck	250		
Live stock, including poultry	74	Total	72,
Meats and their products	519		
Fish and shell fish	40		

Decrease since last year, 15,828 tons.
Transportation lines established during year, none.

Freight transported.

Calendar year ending December 31—	Tons.
1880	50.
1890	129.
1891	88.

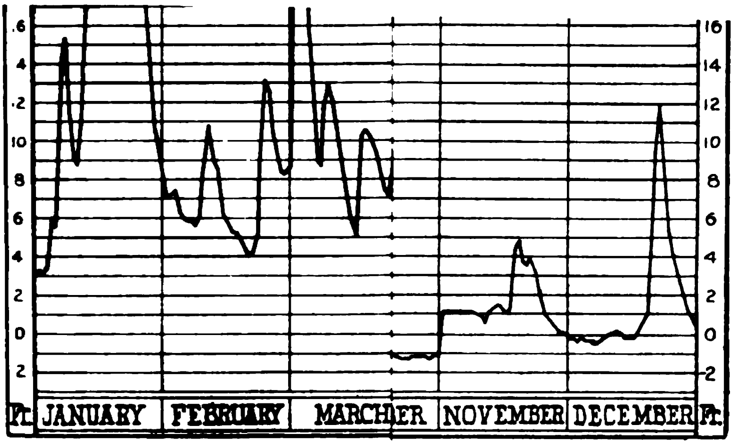
Cape Fear River, North Carolina.

APPROPRIATED.

Date.	Amount.	Aggregate
Mar. 3, 1881	$30,000	$30,00
Aug. 2, 1882	30,000	60,00
July 5, 1884	5,000	65,00
Aug. 5, 1886	11,250	76,25
Aug. 11, 1888	12,000	88,25
Sept. 19, 1890	15,000	103,25
July 13, 1892	15,000	118,25

EXPENDED.

To June 30—		To June 30—	
1882	$14,813.96	1888	$73,851.82
1883	27,801.41	1889	83,322.31
1884	42,502.54	1890	87,971.16
1885	59,013.83	1891	94,354.43
1886	64,530.81	1892	99,230.31
1887	65,832.94		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IMPROVEMENT OF CAPE FEAR RIVER AT AND BELOW WILMINGTON, N. C.

This part of the Cape Fear River is 30 miles long from the confluence of its northeast branch at Wilmington to the ocean bar. It is described and a summary of operations for its improvement by the State of North Carolina from 1823 to 1829, and by the United States from 1829 to June 30, 1892, will be found on pp. 1164 to 1169 of the Annual Report of the Chief of Engineers for 1892.

In a report of February 28, 1889, made pursuant to a requirement of the river and harbor act of August 11, 1888, the cost of obtaining a navigable channel from Wilmington to the ocean, 20 feet deep at mean low water, was estimated at $1,800,000, and the river was reported to be worthy of such improvement. In the Annual Report of June 30, 1889, it was recommended that the improvement "be carried on by widening and deepening the existing river channels to their full dimensions of 270 feet width and 16 feet depth at low water, and by straightening, deepening, and fixing the bar entrance, at a total expense of $25,000 in addition to the funds available June 30, 1889. This whole amount to be appropriated in one sum during the next fiscal year, and to increase the present depth at low water at a further total expense of $1,[illegible]0,000," and it was reported that $300,000 could be profitably expended in the fiscal year ending June 30, 1891.

By the river and harbor act of September 19, 1890, Congress appropriated for "improving Cape Fear River at and below Wilmington, N. C., $170,000."

December 24, 1890, a contract was entered into with Mr. P. Sanford Ross and approved January 8, 1891, for dredging to the depth of 20 feet, and amount of $110,000 to $125,000.

For the reasons stated on pp. 1167, 1168 of the Annual Report of the Chief of Engineers for 1892, the Chief of Engineers, June 9, 1892, directed "that the dredge *Woodbury* be worked on the bar when she can, to obtain as great depth as she can, not to exceed 18 feet at low water; elsewhere, when not on the bar, where her operations may be most advantageous; and that a channel 18 feet deep and as wide as the funds will allow be dredged from the bar to Wilmington in order that the navigation may be improved to that extent as soon as possible, it being left to the experience of the next few years to decide whether it be necessary or expedient to work for a greater depth."

Dredging to the depth of 20 feet, which commenced with work under the above-mentioned contract, at Wilmington, January 19, 1891, ceased with the completion of that contract September 7, 1892. It embraced cutting a channel 270 feet wide and 3,200 feet long through the shoal immediately above Walnut street, and extending to a point 1 mile above Market street, Wilmington, and dredging a channel length of 3¼ miles through the shoals of Alligator Creek and the mouth of Brunswick River next successively below Wilmington, the cut through the former 9,900 feet long being 148 feet wide, and through the latter 7,700 feet long, being 74 feet wide for about three-fifths and 34 feet wide for about two-fifths of its length.

Of the continuous stretch of channel thus obtained, 20 feet in depth and 7¼ miles long, extending from the upper end of Logs and Big Island Shoal, 5½ miles below Wilmington, to the railroad bridge, 1.74 miles above Market street, 3.94 miles or 54 per cent was dredged.

Two hundred and seventy feet is the prevailing width of the channel dredged to the depth of 16 feet. To obtain a channel 18 feet deep and that width (270 feet) from the ocean bar to Wilmington entails the improvement of the river from the lower end of the shoal at Snows Marsh, 7.6 miles above the bar, to the upper end of the shoal at Alligator Shoal, 0.7 of a mile below Wilmington, a distance of 21.3 miles, embracing dredging through nine shoals an aggregate length of 13 miles, 63 per cent of the distance.

A contract was entered into November 3 and approved November 1 1892, with Mr. C. P. E. Burgwyn, of Richmond, Va., for dredging to the depth of 18 feet, in accordance with the foregoing instructions of June 9, 1892, at 12.49 cents per cubic yard, measured in scows, in the shoals Snows Marsh, and at 12.44 cents per cubic yard (so measured) at the other eight shoals, to an amount of not less than $125,000 nor more than $140,000, to commence December 8, 1892, and be completed June 8, 1894. The contractor's plant started from Richmond down the James River December 8, the day prescribed in the contract for the commencement of work in the Cape Fear. The weather, which until that date had been very favorable, immediately thereafter became exceptionally unfavorable and so continued through the winter along the Atlantic coast, causing the loss of three of the contractor's scows and extensive injury to his tugs, entailing upon him much expense and long delay; in consequence dredging did not commence until March 10, from which date to June 30, 1893, an aggregate of 110,301 cubic yards have been dredged under the contract from Brunswick River, Reeves Point, and Midnight Shoals, amounting to $13,721.44.

The following is a summary of the work upon the shoals in the river during the fiscal year ending June 30, 1893:

Under the contract with P. Sanford Ross there were dredged from Brunswick River Shoal, to the depth of 20 feet, 30,912 cubic yards of material at 13¼ cents per cubic yard, 53 stumps and 12 logs, at an aggregate cost of $5,925.84. Under the agreement with Mr. Ross, supplemental to his contract entered into May 16, 1892, to arrest shoaling that threatened serious detriment to navigation, as explained in the last Annual Report, 7,185 cubic yards were redredged at Snows Marsh Shoal, costing, at $15.79 per hour, $1,646.11; under the contract with Mr. Burgwyn there were dredged as above, from Brunswick River, Reeves Point, and Midnight Shoals, 110,301 cubic yards of material, costing, at 12.44 cents per cubic yard, $13,721.40, and by the United States suction dredge *Woodbury* during 180½ days' work, when she could not work on the bar, there were redredged from Snows Marsh Channel 74,931 cubic yards of material.

The aggregate quantity of material removed, exclusive of stumps and logs, during the year is, therefore, 223,329 cubic yards.

Of the channel, aggregating 11.2 miles in length, dredged to the various depths of 16, 18, and 20 feet through the nine shoals in the river above the bar, 0.9 of a mile, or 8 per cent, have deteriorated by shoaling, embracing parts of the channel at Lilliput, Midnight, and Snows Marsh (or Horse Shoe) Shoal, at which the minimum channel depths at low water are respectively 14 feet, 15 feet, and 14.2 feet; 14 feet at mean low water is, therefore, the controlling channel depth from the bar to Wilmington, June 30, 1893.

The present cut through Snows Marsh Shoal was finished to the width of 233 feet and depth of 16 feet in May, 1890. Since that date there have been redredged from it, in February and March, 1891, by the first supplemental agreement to the contract with Mr. Ross, 8,804 cubic yards, leaving a channel 90 feet wide and 16 feet deep; in May, June, and July, 1892, under the second supplemental agreement to that contract, 46,628 cubic yards, leaving a channel 80 feet wide and 18 feet deep at low water; and by the United States suction dredge *Woodbury* in 53 days' work 143,673 cubic yards, making a total of 199,109 cubic yards redredged in the past three years from this shoal, through which the minimum channel dimensions are now, June 30, 1893, 100 feet width and 14.2 feet depth at mean low water. As stated in the last Annual Report of the Chief of Engineers, page 1167, a channel 270 feet wide and 16 feet deep, completed in December, 1889, through this shoal to the west of the present channel, and redredged in 1886, 1887, and 1888, was in October, 1889, abandoned on account of incessant and extensive shoaling.

Current observations have been commenced to obtain information for guidance in designing regulating works in an endeavor to stop the shoaling in the present channel.

Since the channel on the ocean bar increased to the dimensions caused by closing New Inlet in 1879, the depth on what is known as the inner shoals has usually been less, and the channel there narrower, than on the outer crest of the bar, 3,000 to 3,500 feet farther seaward.

In 1880 the depth at mean low water was on the main bar 14 feet, and on the inner shoal 13 feet; in 1881 they were respectively 16 feet and 14 feet; in 1882 the depth at mean low water on both the bar and inner shoal was 14 feet, but the channel was 500 feet wide on the bar and about 220 feet on the shoal.

In 1883 there was a practicable channel 14 feet deep at mean low water, but, adds the report, "the difficult and narrow part of it is, as ever, on the inner shoal."

In 1884 the least depth in a practicable ship channel was still 14 feet. "The channel was wider than ever across the outer bar, the only difficult portion being on the inner shoal."

In 1885 on the inner shoal the depth was 14 feet, and the least width 250 to 300 feet a very short distance; over the outer crest fully 15 feet could be carried with a greater width.

In 1886 the depth was reported 13½ to 14 feet and the narrowest place, which was at the inner shoal, had a width of 350 feet. The report added:

> The harbor inside of Baldhead Point can be made from the sea with two courses and 14 feet depth at mean low water.

In March, 1887, dredging by the *Woodbury*, which had been suspended since October, 1881, was resumed at the Baldhead Bar, to straighten the channel "on the line of the channel from Baldhead Point directly toward the bar through the deep pocket," on which line the least depth was 12 feet at low water, and the distance between 13-foot curves fully 550 feet. This line avoided the inner shoals. By the dredging of 10,125 cubic yards the least depth had been increased to 12½ feet by June 30. In the old channel, run in two courses, the least depth was 14 feet and the least width 350 feet. The *Woodbury* was working for a straight channel, permitting one course from the sea to deep water inside Baldhead Point.

In 1888, by dredging 50,420 cubic yards, the least depth in a direct line across the bar was increased to 15 feet for the full width of 200 feet; but the pilots still used the former channel, in which the least depth was 14 feet at mean low water.

In 1889 (to June 30) 22,686 cubic yards were dredged from the bar; the best depth was on the direct line across it, on which the least depth was 15½ feet (at mean low water).

In 1890, 52,307 cubic yards were dredged from the bar and 17 feet at mean low water could be carried across it; at the outer crest the distance between the 18-foot curves was but 200 feet and between the 20-foot curves but 400 feet. The report adds:

> There are some inner shoals about 3,000 feet inside the bar where the available depth does not exceed 17 feet. These yield more readily to the work of the *Woodbury* than the shoal at the outer crest.

In 1891, 54,716 cubic yards was dredged from the bar, and at its outer crest the least depth with a channel width of 200 feet was 18.1 feet (at mean low water), but at the inner shoals, 3,000 feet inside the bar, the available depth did not exceed 17 feet.

In 1892 the channel on the outer crest had maintained its depth of 18.1 feet, but the distance between the 20-foot contours outside and inside the crest had increased to 750 feet; the deep-water pocket inside the bar had extended inward 500 feet, and the inner shoals moved likewise, being 3,500 feet inside the outer bar; the *Woodbury* dredged 46,599 cubic yards from them, sharpening their crests and straightening the channel over them, but the depth on them continued 17 feet as in 1891.

During the fiscal year just closed in 55½ days' work, from December, 1892, to June 30, 1893, the *Woodbury* dredged from the inner shoals 27,060 cubic yards, but did no dredging on the outer part of the bar, 3,500 feet farther seaward, across which the channel is, as it was in June, 1892, 750 feet long between 20-foot contours and 18.1 feet deep at mean low water. For 500 feet from the outer crest the channel is 140 feet wide and the depth is 17.7 feet over an additional width of 60 feet. At the inner end of the 500 feet the width abruptly widens to 500 feet, increasing in 250 feet to a depth of 20 feet and in a farther 50 feet to a depth of 22 feet. On the inner shoals, notwithstanding all the dredging the weather permitted the *Woodbury* to do there from December to June 1, amounting to 19,798 cubic yards, the advance into the channel of the shoal on its easterly side induced the abandonment of the channel on the latter date, and the adoption of another and more favorable channel about 140 feet farther west and in direct alignment with the channel across the outer part of the bar. The least depth at mean low water in this channel June 30 is 15.2 feet, being 1.8 feet less than the least depth in the best channel through these inner shoals in June, 1892, when it was 17 feet; but the total length of dredging (in two places) is only 100 feet to obtain a continuous depth of 16 feet, and (in three places) only 300 feet (total) to obtain a continuous depth of 17 feet. It is therefore expected that the favorable summer season for dredging will soon permit the *Woodbury* to restore the depth to 17 feet. The total length of that part of these inner shoals where the depth is less than 18 feet is 1,550 feet. Hitherto vessels have had to make one change of course in crossing the bar, but since the adoption, June 1, of the new channel at the inner shoals there is but one course straight across the entire bar from the river to the sea.

From July until December the *Woodbury* had to be withdrawn from the inner shoals at the bar to contend with the troublesome shoaling at Snows Marsh, where the channel depth was the controlling depth between the port of Wilmington and the sea. Its diminution from extensive and persistent shoaling threatened to throttle traffic at the season of the year when the largest shipment of cotton is made from Wilmington, and ships of deepest draft descend the river. By dredging such a depth was maintained that several vessels of 1,800 to 1,932 tons loaded each with 9,000 to 9,710 bales of cotton, and drawing 16 feet 2 inches to 17 feet 10 inches, passed down the river; one, the *Holyrood*, went down from Wilmington drawing 18 feet 3 inches, and after taking on 1,250 more bales of cotton at Southport crossed the bar drawing 20 feet and 3 inches.

The *Woodbury* was, moreover, laid up for repairs fifty-six days during the year, and the usual prevalence of stormy weather on the Atlantic coast during the winter, together with more than the usual proportion of southwesterly winds, which blow directly into the mouth of the river, further curtailed the time when she could work upon the bar.

By gradual deterioration the *Woodbury* is becoming year by year less seaworthy and more liable to be driven by unfavorable weather from her work on the bar. Owing to the small capacity, 50 cubic yards, of her sand bin she loses much time on the way between the bar and the dumping ground. The work of the ensuing year may demonstrate whether, with a reasonable expenditure for repairs, she can, in the time annually that the weather will permit her to work on the bar, obtain and maintain on the 1,550 feet of channel on the inner shoals the depth of 16 feet maintained on the outer bar without dredging for three years past, or whether it will be necessary to replace her with another vessel to insure the maintenance of an adequate channel on the bar.

To provide for the possible necessity of replacing the *Woodbury* by a new vessel and of constructing regulating works at Snows Marsh and for the completion of the dredged channel through the shoals in the river to the depth of 18 feet at mean low water and width of 270 feet, it is especially important and for the best interests of the improvement that the full amount of $400,000 be appropriated for the fiscal year ending June 30, 1895.

It appears from the published report of the president of the Wilmington Produce Exchange for the calendar year 1892 that the shipment of cotton from Wilmington was 163,510 bales in 1892, against 160,267 bales in 1891; that in 1891 the receipts of cotton decreased at New Orleans 30 per cent, at Savannah 24 per cent, at Charleston 40 per cent, and at Norfolk 49 per cent, while it increased at Wilmington 1¼ per cent; that the receipts of spirits of turpentine were 57,536 casks in 1892, against 58,999 casks in 1891; of rosin, 261,894 barrels in 1892, against 294,520 barrels in 1891; of tar, 67,142 barrels in 1892, against 64,798 barrels in 1891; of crude turpentine, 14,855 barrels in 1892, against 13,924 barrels in 1891; and that 29,026,414 feet of lumber were exported in 1892, against 26,115,927 feet in 1891.

Four well-appointed sawmills are now building at Wilmington, which it is said will have a total capacity of 240,000 feet of lumber daily, which will greatly increase the output of lumber from this port to be drawn from the extensive tracts of timber land accessible from the Cape Fear River and its branches.

Details regarding the location of dredging, extent and location of the deteriorating parts of the channel, surveys, and repairs to and condition of plant will be found in the appended report of Mr. E. D. Thompson, assistant engineer, who has been in immediate charge of the improvement during the year.

This river is in the collection district of Wilmington, N. C.

Money statement.

July 1, 1892, balance unexpended		$36,
Amount appropriated by act approved July 13, 1892		200,
		236,
June 30, 1893, amount expended during fiscal year		58,
July 1, 1893, balance unexpended		178,
July 1, 1893, outstanding liabilities	$8, 726. 07	
July 1, 1893, amount covered by uncompleted contracts	126, 278. 56	
		135,
July 1, 1893, balance available		43,
Amount (estimated) required for completion of existing project, if to 18 feet		400,
Amount (estimated) required for completion of existing project, if to 20 feet		1, 430,
Amount that can be profitably expended in fiscal year ending June 30, 1895		400,

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for dredging opened at 11 o'clock a. m., October 20, 1892, b W. S. Stanton, Corps of Engineers.

No.	Name and address of bidder.	Price per cubi	
		For work at Snows Marsh.	Fo
		Cents.	
1	C. P. E. Burgwyn, Richmond, Va	$12\frac{49}{100}$	
2	Atlas Dredging Co., Wilmington, Del.*		
3	American Dredging Co., Philadelphia, Pa	$16\frac{4}{10}$	
4	P. Sanford Ross, Jersey City, N. J	$16\frac{9}{10}$	

* Bid withdrawn.

NOTE.—All bids were for scow measure.

Awarded to bidder No. 1, C. P. E. Burgwyn.
There is $200,000 available for work on this improvement.
Proposals invited for from $125,000 to $140,000 worth of work.

REPORT OF MR. E. D. THOMPSON, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., June 30,

MAJOR: I have the honor to submit the following report of operations for t provement of the Cape Fear River, North Carolina, at and below Wilmington, fiscal year ending June 30, 1893.

On July 1, 1892, the following dredging had been completed, the depths dredged channels referring to mean low water:

Locality of dredging.	Cleared chann	
	Length.	Depth.
	Feet.	*Feet.*
Wilmington Shoal	3, 200	20
Alligator Creek	9, 900	20
Brunswick River	*3, 379 4, 321	20 20
Logs and Big Island	8, 500	16
Lilliput	11, 000	16
Old Brunswick Cove	1, 000	16
Midnight	7, 400	16
Reaves Point	700	16
New Snow's Marsh (bottom width)	9, 600	16

* Partially completed.

The bar channel had been dredged to a depth of 17 feet and width varying from 100 to 200 feet. All work was in progress July 1, 1892.

Dredging was continued under an uncompleted contract (and supplementary agreement thereto) with P. Sanford Ross, dated December 24, 1890, from July 1 to September 7, 1892, when all work under this contract was completed. Under the main contract 30,912 cubic yards of mud, sand, and roots, 14 logs, and 86 cypress stumps were removed from Brunswick River Shoal, leaving a channel through the shoal 5,133 feet long, 74 feet wide, and 20 feet deep, and a partially completed channel of 2,567 feet length, 37 feet width, and 20 feet depth at low water. The large number of stumps encountered prevented the completion of the 74-foot channel, as was expected. Dumpage was placed in the slough at mouth of Brunswick River.

Under the supplementary aggreement to the contract, dated May 16, 1892, 7,185 cubic yards of mud and sand was removed from Shoal A, in the lower part of New Snows Marsh Cut, leaving a channel entirely through the shoal of 80 feet width, 1,649 feet length, and 18 feet depth at low water. This dredging was done on the fifth cut of the channel as originally dredged, and ended at the 16-foot contour below low water, on the south side of the shoal. Dumpage was placed in the angle of the Old Snow's Marsh Cut.

Under a contract with Mr. C. P. E. Burgwyn, dated November 3, 1892, dredging commenced March 10, 1893, and is now in progress. To date 110,301 cubic yards of sand and mud have been removed, as follows:

From Brunswick River Shoal, 4,033 cubic yards of material from 1,467 linear feet of cutting 37 feet wide, leaving a completed channel through the shoal of 6,600 feet in length, 74 feet width, and 18 to 20 feet depth at low water.

From Reaves Point Shoal, 26,748 cubic yards of material, leaving a completed channel through the shoal of 2,000 feet length, 74 feet width, and 18 feet depth at low water.

From Midnight Shoal, 79,520 cubic yards of material from 13,796 linear feet of cutting 37 feet wide and 18 feet deep at low water, completing a channel through the shoal 13,000 feet long and 37 feet wide, and a partial channel 796 feet long and 74 feet wide, both being 18 feet deep at low water.

Dumpage was disposed of as follows: That from Brunswick River Shoal was placed in the slough at mouth of Brunswick River, that from Reaves Point Shoal in the angle of Old Snow's Marsh Cut, and that from Midnight Shoal in the Old Snow's Marsh Cut on ebb tide and in the pocket north of Ferris's Wharf on the flood.

Work under this contract should have commenced December 10, 1892, but was delayed by a succession of disasters involving the loss of 4 dump scows while towing from Norfolk, Va., to Wilmington, N. C. Only 1 of those scows was afterwards recovered.

The following is a summary of work done during the year under the two contracts:

Name of shoal.	Contractor.	Quantity excavated.	Removed.		Completed channel.		
			Logs.	Stumps cypress.	Length.	Width.	Depth.
		Cu. yds.			*Feet.*	*Feet.*	*Feet.*
Brunswick River....	P. S. Ross	30,912	14	86	5,133	74	18
New Snow's March..	....do...............	7,185	....	....	1,649	80	18
Brunswick River....	C. P. E. Burgwyn....	4,033	....	....	6,700	74	18-20
Reaves Point........	....do...............	26,748	....	....	2,000	74	18
Midnight............	....do...............	79,520	....	....	13,000 796	37 74	18 18

The dredges employed were No. 7, working from July 1 to September 7, 1892, and the *Occoneechee* working from March 10 to June 30, 1893.

The suction dredge *Woodbury* has been employed continuously during the year, except when undergoing repairs, in dredging in the Baldhead Channel across the bar and in the New Snows Marsh Channel.

The following statement shows the number of days worked and the material dredged by this boat during the year:

Month.	Dredging done and number of days dredged.				Total.	
	Bar.		Snow's Marsh.			
	Days.	*Cu yds.*	*Days.*	*Cu. yds.*	*Days.*	*Cu.* [illegible]
1892.						
July			23	9,439	23	[illegible]
August			23	9,885	23	[illegible]
September			23	9,499	23	[illegible]
October			22	8,889	22	[illegible]
November			3	965	3	[illegible]
December	6	2,294	11	3,451	17	[illegible]
1893.						
January	8	3,529	11	3,865	19	[illegible]
February	3	917	18	6,859	21	[illegible]
March	6½	3,400	15½	7,390	22	[illegible]
April	10	5,279	11	5,883	21	[illegible]
May	8	4,379	12	7,030	20	[illegible]
June	14	7,262	8	3,781	22	[illegible]
Total	55½	27,060	180½	74,931	236	[illegible]

The boat was laid up for repairs from October 4 to November 8, during which time the machinery was thoroughly overhauled and general repairs made to the hull and house.

The cost of operating the dredge, including all repairs, has been $11,456.57, at the rate of 11.23 cents per yard of material excavated.

The actual cost of maintaining the dredge, including superintendence, deterioration, etc., was $12,722.99, or at the rate of 12¼ cents per yard.

The work done has been the maintenance of that part of the channel dredged in previous years from Baldhead to the ocean crossing the Gunboat Shoals. The channel was originally dredged to a width of 200 feet and depth of 17 feet at low water. In New Snow's Marsh Cut the channel dredged across Shoal A in the lower part of the cut during June and July, 1892, was redredged during the year. Severe weather and southeasterly winds interfered greatly with the work on the bar during the winter months.

Examinations and surveys were made during the year of all the dredged channels of the bar, the Baldhead beaches, the "Swashes," the Snow's Marsh Shoals, the river in front of Wilmington with a view to the establishment of harbor lines, and of the dam.

All range piles bent or cut down by the ice of last winter have been renewed and a rigid basis for maps maintained by rebuilding all decayed triangulation stations.

The dredged channels in the river above Big Island are deeper than when first dredged, and all others are maintaining the dimensions to which they were originally dug, except as follows:

At Lilliput Shoal the shoaling reported last year still continues. Just below the angle for a distance of 500 feet the minimum channel depth is 15 feet. At 1,650 feet below the angle another shoal 650 feet long has formed entirely across the cut, the minimum channel depth on which is 14 feet only; everywhere else the cut is fully 16 feet deep for a width of 270 feet. The entire cut will be dredged to a width of 100 feet and depth of 18 feet under the present contract.

At Midnight Shoal, previous to the present dredging, the shoal on the east side of the cut at and below the angle had scoured so that the minimum channel depth had increased to 16 feet. The shoaling in the upper reach had increased so that at a distance of 1,600 feet above the angle a shoal 2,200 feet long extended entirely across the cut with a minimum depth of 15 feet. At the northern end of the upper reach a slight shoaling had also occurred for a distance of 3,500 feet, making it necessary to extend the line of dredging that distance up stream. The length of cut between the 18-foot contours below low water was, therefore, 13,000 feet. The material of which this shoal is composed is a very soft mud. In 1889 in the vicinity of the angle the cut was redredged for a distance of about 2,200 feet to 16 feet depth, 100,000 yards being removed at the time. The original cut was dug in 1883.

Some deterioration is to be expected in channels dredged in such a wide tidal estuary as the lower Cape Fear River, and that which has occurred is, in reality, much less than might reasonably have been looked for in the 10 years that have elapsed since the channel was originally dug.

At New Snow's Marsh the two shoals A and B formed in the cut during last year have continued to give trouble. The cut dredged across shoal A to a width of 80

ıd depth of 18 feet had, in April, 1893, filled up so that, at that time, the least
in the channel in the vicinity of the shoal for 1,000 feet was 14.6 feet. At
t the shoal is 1,400 feet long and the least depth is 14.2 feet for a width of 100
At Shoal B. the available channel width with the 16 feet depth is now, as last
00 feet, The surveys show only a slight increase in this shoal during the
The depths in other parts of the cut seem to be well maintaining themselves.
f the work of the *Woodbury* in the cut has been on Shoal A. The results of
ıd previous years' work indicate that dredging at this locality under the pres-
ıditions will afford only temporary relief, and that other means will be neces-
ı connection with this dredging to secure a permanent channel. The river
and below the shoal is narrow and deep, and at the shoal spreads out to a
of 8,500 feet, 2,800 feet wider than immediately above it. Current observa-
ınd surveys were made during May, preliminary to submitting a project for
nstruction of contraction works at this shoal. Such works are, in my opinion,
ary for the preservation of a channel depth of 18 feet from the bar to Wil-
on, and an estimate of their cost is submitted later in this report.
condition of the bar is not as favorable as at this time last year. The Gunboat
or inner shoals, 3,500 feet inside the outer bar are gradually working in a
vest direction directly across the Baldhead dredged channel with the result
ı April there was in a channel around the shoals to westward 1¼ feet more
than in the Woodbury channel directly across them. This is undoubtedly
the very severe southeasterly storms and winds of last winter, which, during
onths of December, January, February, and March only allowed the *Wood-*
ɔ work on the bar 27½ days, during which time 13,125 cubic yards of sand
lredged. The operations of the *Woodbury* have undoubtedly retarded, in a
legree, the progress of the shoal and thus kept the westward channels open.
rvey of the bar made in May, 1893, showed its condition to be as follows: The
el on the outer crest or bar proper has maintained its depth of 18.2′. The
ce from the 20-foot curve outside to the 20-foot curve inside is as last year, 750
This part of the bar, therefore, shows no change, and no work has been done
luring the year. The inner or Gunboat Shoals, commencing 3,500 feet inside
ter bar and extending 2,000 feet to deep water inside, carry a least depth of
The total distance over these shoals, on which the depth is less than 18 feet,
0 feet; the distance over the same shoals on which the depth is less than 16
100 feet only, and this distance is composed of two short shoals, each 50 feet
on which the minimum depth is as stated, 15.2′. These shoals are now being
ed at every favorable opportunity. The depths above given are all for low
The average rise of the tide on the bar is 4½ feet, and at times has exceeded
The shoaling in the Woodbury channel has continued to such an extent that
decided in June to change the line of dredging to a different channel, the
on of which is shown on the map of the bar accompanying this report. The
of the old gunboat mentioned in last years' report as obstructing the channel
May and June removed.
wreck has in past years been a serious shoal-forming cause, and it is expected
s removal will affect very favorably the prosecution of future bar work.
hange has been observed in the good condition of the dam. The area between
the beach continues gradually to shoal. The main swash at Gold Leaf has
ved from a width of 1,790 feet in 1890 to 665 feet in 1893 at high water. New
wash and the north swash remain about as last year, except that the outer
t New Inlet has widened and extended itself seaward and across the inlet fully
t, so that from the ocean the beach line appears continuous.
naterial changes have occurred in the shore lines of Zekes Island and Federal

aldhead the accretions of last year still continue; at Oak Island slight erosion
ken place opposite Fort Caswell, on the river side, with accretions on the sea

plant belonging to the improvement is hardly in fair condition. The *Woodbury*
ıite thoroughly overhauled, as regards machinery, in October and November
2. The hull continues to get gradually worse and is now in such condition that
ıeavy sea swell the boat can not work. An examination of the hull made on
, 1893, showed that to thoroughly repair it would cost between $3,000 and
and might cost more. The boat was purchased by the United States in 1873.
proposed dikes at Snow's Marsh render suction dredging there unnecessary in
ar future, then the most economical and effective bar work would be attained
ıuch larger boat, as has been heretofore recommended for this improvement.
ear or two at the most the boat, unless thoroughly repaired, will be unfit for
ork except when the sea is very smooth. The *Easton* has been in use during
ar. The boat was laid up from December 16 to February 15, during which
ıew legs were put on the boiler, thirty-four new timbers placed under the
, and new center keelsons put in. The boat is now in constant use for surveys
ıspection trips.

The launch *Oklahoma* was transferred to Supt. Schuster in March. engine and boiler were put on the pile driver in October and the boat piles by steam, a decided improvement over the old hand machine. O plant the coal and water scow and one 100-ton deck scow are in fair con drag scow and six deck scows are in ordinary condition; the hoister and were condemned during the year. The wharf at Southport is in good Island Wharf will probably soon have to be abandoned unless extensivel The only notable addition to plant during the year is the 14-foot Hallada and storage tank of 5,000 gallons capacity recently erected on the United ervation at Southport for supplying the *Woodbury* with fresh water.

The plant is valued at $19,939.89.

The work remaining to be done July 1, 1893, to secure and maintain a 270 feet width and 18 feet depth at mean low water from Wilmington to and its cost at present rate of appropriation is estimated as follows:

First. Contract dredging.

Name of shoal.	Length of channel.
	Feet.
Alligator Creek	8,960
Brunswick River	6,600
Logs and Big Island	11,000
Keg Island (extension of Lilliput)	3,200
Lilliput	13,100
Old Brunswick Cove	2,200
Midnight	13,000
Reaves Point	2,000
New Snow's Marsh	11,300
Total	71,360

Contract dredging, 2,815,965 yards, at 15 cents

Second. Suction dredging by United States plant on bar and in Snows Marsh:

Original cost of one new suction dredge $45,000

Operating suction dredge nine years, at $25,000

Third. Contraction works at Snows Marsh:

18,000 linear feet of brush and pile dike, at $4

Add 25 per cent for superintendence, contingencies, etc

Deduct amount available for dredging under present contract

Balance

The price of dredging is based on its probably increased cost under future priations due to the nature of the work; the proposed dikes, training walls, e pile and brush structures similar to those successfully used on James River, Vi where they were put in by contract at $3.47 per linear foot. The need for powerful suction dredge to be owned and operated by the United States maintenance and deepening of channels already dredged, especially on the very urgent. The next appropriation can be best expended in the purchase o a dredge and in the construction of the Snows Marsh dike.

Appended to this report is a tabulated statement, giving names and tonnage steamers plying on the Cape Fear River, North Carolina, or regularly enteri port of Wilmington.

The expenditures of the year have been—

For dredging in river	$44,
For work on the bar	3,
Total	48,

As follows:

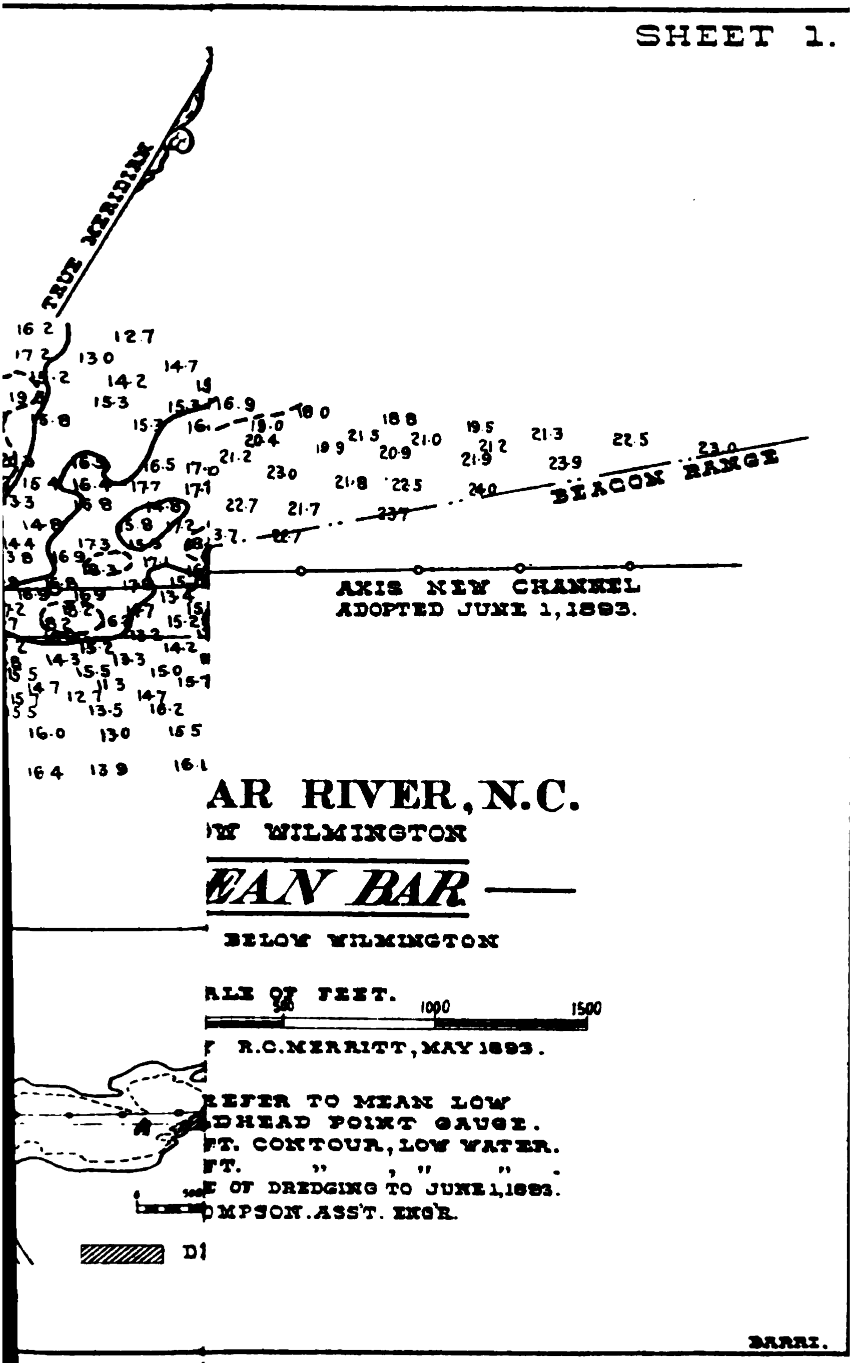
For construction and general repair of plant	$1,497
For care of property	1,941
For general superintendence	5,628
For detailed surveys	2,977
For contract work	25,077
For other general work	11,426
Total	48,546

Cost of contract dredging per yard, all expenses:

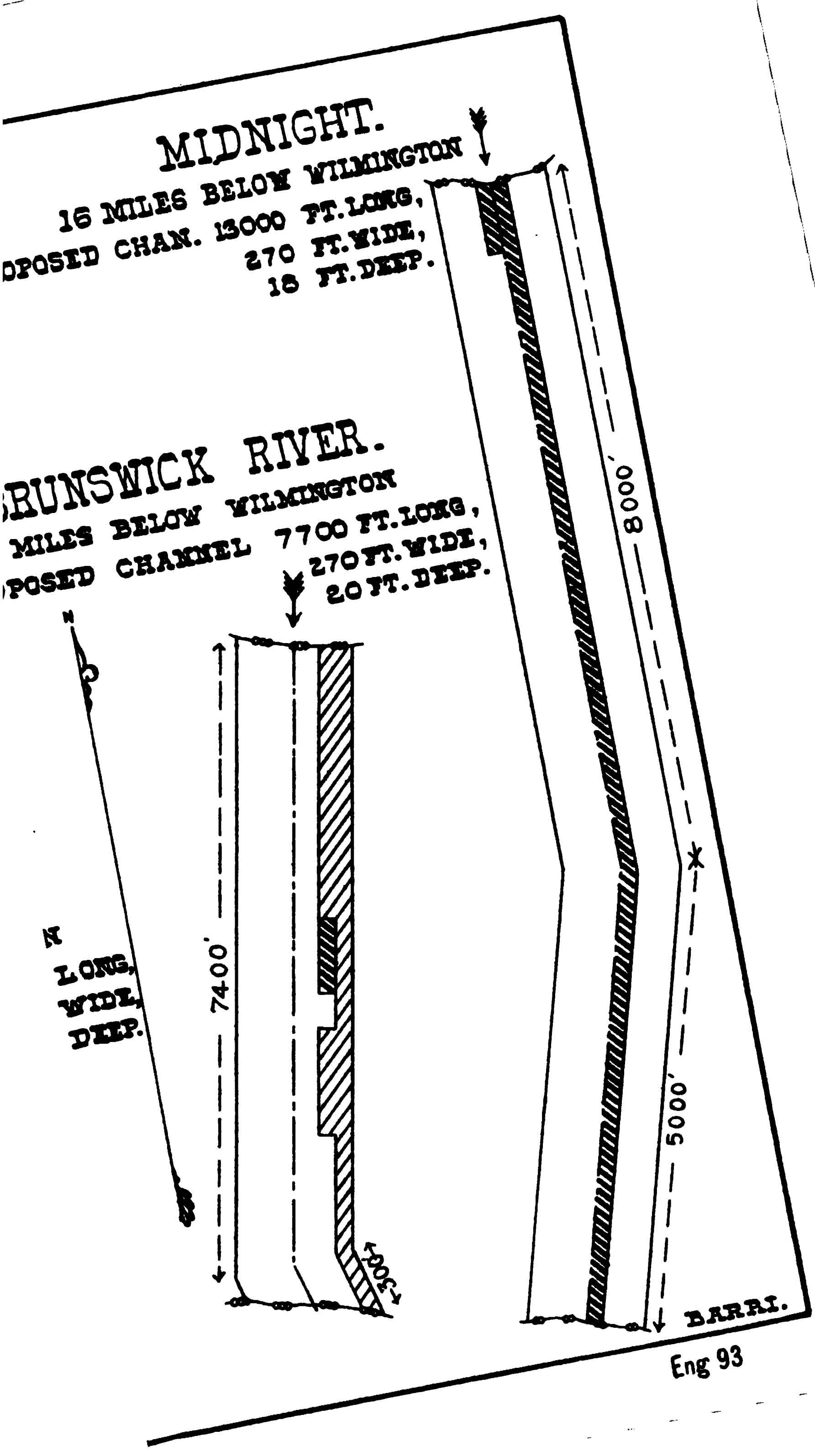
By Ross

By Burgwyn

Cost of dredging per yard by United States suction dredge *Woodbury*


SHEET 1.
TRUE MERIDIAN
BEACON RANGE
AXIS NEW CHANNEL
ADOPTED JUNE 1, 1893.
AR RIVER, N.C.
W WILMINGTON
EAN BAR
BELOW WILMINGTON
ALE OF FEET.
500
1000
1500
F R.C.MERRITT, MAY 1893.
REFER TO MEAN LOW
DHEAD POINT GAUGE.
FT. CONTOUR, LOW WATER.
FT. " , " " .
E OF DREDGING TO JUNE 1,1893.
MPSON. ASS'T. ENG'R.
D
BARRI.

Eng 93


MIDNIGHT.
16 MILES BELOW WILMINGTON
OPOSED CHAN. 13000 FT. LONG,
270 FT. WIDE,
18 FT. DEEP.
8000'
5000'
BRUNSWICK RIVER.
MILES BELOW WILMINGTON
POSED CHANNEL 7700 FT. LONG,
270 FT. WIDE,
20 FT. DEEP.
N
7400'
300'
N
LONG,
WIDE,
DEEP.
BARRI.

Eng 93

At the date of this report there is a continuous channel of 18 to 20 feet depth with width varying from 270 to 74 feet from Wilmington 7 miles down to Logs and Big Island Shoal; thence 16 feet depth and 270 feet width 4½ miles to Lilliput Angle; thence for one-half mile the minimum depth is 14 feet for a width of 270 feet; thence 8 miles to New Snow's Marsh Cut 16 to 18 feet depth with width varying from 37 to 270 feet; thence 16 feet depth, with a width varying from 100 to 233 feet, 9 miles to the ocean bar, excepting 1,400 feet in length at Shoal A, in New Snow's Marsh Cut, where the depth is 14.2 feet in a channel 100 feet wide; and thence a least depth to sea of 16 feet in a channel varying from 100 to 1,000 feet in width, excepting on two short shoals, aggregating 100 feet in length where the least depth is, June 30, 15.2 feet.

The funds on hand are sufficient to dredge a continuous channel 18 feet deep and of a width varying from 75 to 100 feet from Wilmington to the bar by July 1, 1894.

The deepest laden vessel passing down the river to the ocean during the year was the steamship *Holyrood*, 1,777 tons, its draft being 13 feet 3 inches from Wilmington to Southport, and thence to sea 20 feet 2 inches.

Messrs. O. B. Fulford and Frank D. Perry, inspectors, Capt. J. W. Woodside, Robert C. Merritt, and Miss Florence Willis have had charge, respectively, of dredging operations, the *Woodbury*, surveys, and the clerical work. All have rendered very efficient service.

Very respectfully, your obedient servant,

E. D. THOMPSON,
U. S. Assistant Engineer.

Maj. W. S. STANTON,
Corps of Engineers, U. S. A.

COMMERCIAL STATISTICS.

List of steam vessels plying on Cape Fear River, N. C., at and below Wilmington, or regularly entering the port of Wilmington, N. C., during the fiscal year ending June 30, 1893.

Name of vessel.	Net tonnage.	Ports between which they ply and number of round trips made.
Blanche	47.12	Harbor and sea towing.
Alexander Jones	69.37	Do.
Italian	29.37	Do.
Compton	53.94	Harbor towing.
Marie	13.35	Do.
Lawrence	10.54	Harbor towing to October, 1892.
Charles Killam	6.66	Do.
Pastime	14.14	Pleasure boat.
Imperial	17.14	Harbor towing.
C. F. D	4.00	Do.
F. and F	9.10	Do.
Wilmington	110.09	1 daily trip to Southport, 8 months; 3 daily trips to Carolina Beach, 4 months.
Passport	42.83	1 daily trip to Southport, 3 months; 1 daily trip to Carolina Beach, 3 months.
Clarence	38.65	1 daily trip to Southport, 2 months.
Navassa	3.00	Harbor towing, 3 months.
Ida Louise	4.00	Pleasure boat.
Pender	14.03	Irregular trips up Northeast River and harbor towing.
W. T. Daggett	50.57	Semiweekly trips to Point Caswell to November, 1892.
Lisbon	66.94	Semiweekly trips to Clear Run.
A. P. Hurt	140.11	Regular steamers between Wilmington and Fayetteville, N. C.; 4 trips per week each way to April, 1893; since then 2 round trips per week.
Cape Fear	156.32	
D. Murchison	140.72	
Pawnee	858.94	New York and Wilmington South Carolina Co.; 1 trip per week between New York and Georgetown, S. C., touching at Wilmington, N. C.
Croatan	827.25	
Pet	5.00	Harbor towing.
Messenger	7.34	Pleasure boat.
Elk	14.07	Semiweekly trips to Town Creek.
Lizzie L	4.00	Pleasure boat.
Emily Gleaves	4.00	Harbor towing.

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Maj. W. S. Stanton,
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Messenger	7.34	Pleasure boat.
Elk	14.07	Semiweekly trips to Town Creek.
Lizzie L.	4.00	Pleasure boat.
Emily Gleaves	4.00	Harbor towing.

Freight transported.

Calendar year ending Dec. 31—
1869
1889
1890
1891

Cape Fear below Wilmington.

APPROPRIATED.

Date.	Amount.
Mar. 2, 1829, to July 22, 1854	
July 11, 1870	$100,00
Mar. 3, 1871	75,00
June 10, 1872	100,00
Mar. 3, 1873	100,00
June 23, 1874	150,00
Mar. 3, 1875	150,00
Aug. 14, 1876	132,50
June 18, 1878	160,00
Mar. 3, 1879	100,00
June 14, 1880	70,00
Mar. 3, 1881	140,00
Aug. 2, 1882	225,00
July 5, 1884	200,00
Aug. 5, 1886	157,50
Aug. 11, 1888	245,00
Sept. 19, 1890	170,00
July 13, 1892	200,00

* Balance of $3,728.07 turned over to surplus fund.

EXPENDED.

To June 30—		To June 30—
1829 to 1858	$359,500.85	1882
1871	102,514.18	1883
1872	177,950.67	1884
1873	284,063.32	1885
1874	377,048.45	1886
1875	463,712.57	1887
1876	652,277.28	1888
1877	719.567.75	1889
1878	806,941.76	1890
1879	938,408.82	1891
1880	1.042,390.55	1892
1881	1,131,949.68	

L 20.

IMPROVEMENT OF LOCKWOODS FOLLY RIVER, NORTH CA

The depth on the ocean bar is changeable, but at ordina
usually about 4 feet at low and 8 feet at high water. Th
can be carried at those stages 1½ miles up the channel unt
spreads to one-half to three-fourths of a mile in width over
interspersed with beds of oyster rock, over which for fully 1
channel depth averages less than 1 foot at low water. From
over which vessels can carry 3½ feet at ordinary high wate
carry, except for 300 feet at Dixons Landing, 5 feet at low w

Tonnage of vessels of 100 tons and over for year ending December 31, 1892.

Vessels.	Foreign.		American.		Total.	
	No.	*Tons.*	*No.*	*Tons.*	*No.*	*Tons.*
Steamers	22	33,409	53	44,293	75	77,702
Barks	65	30,900	......	....	65	30,900
Brigs	11	2,750	5	1,538	16	4,288
Schooners	11	1,520	127	38,169	138	39,689
Total	109	68,579	185	84,000	294	152,579

NOTE.—No record is kept of vessels of less than 80 tons.

Entrances, clearances, and vessels documented for years ending December 31, 1891 and 1892.

[From custom-house records.]

	1891.	1892.
Foreign:		
Entrances	132	107
Clearances	191	162
American:		
Entrances	*124	*106
Clearances	*82	*70
Total	529	444
Vessels documented:		
Registers, vessels	......	23
Enrollment, vessels	......	10
Licenses over 20 tons	......	28
Licenses under 20 tons	......	26
Total	66	87

* These figures are complete as regards foreign vessels only. Vessels arriving from and departing to domestic ports are not compelled to enter and clear; therefore the number as above reported does not include all domestic vessels.

All the above vessels are of 100 tons and over.

Cotton steamers loaded at the port of Wilmington, N. C., during the year ending December 31, 1892.

[Furnished by Messrs. Alex. Sprunt & Son.]

Name of steamer.	Tonnage.	Draft, loaded.		No. of bales.	Remarks.
		Ft.	*In.*		
Berth	1,083	16	9	4,700	Loaded by Alex. Sprunt & Son.
Torgorm	1,058	16	10	5,338	Do.
Smeaton Tower	880	16	7	4,000	Do.
Southwold	1,204	17	3	5,750	Do.
Leander	1,888	17	10	9,600	Do.
Hurworth	1,567	16	2	7,150	Do.
Maltby	1,803	16	5	9,000	Do.
Calliope	1,926	16	9	9,000	Do.
Ormsby	1,828	17	2	9,180	Do.
Headlands	1,932	17	5	9,710	Do.
Dera	937	15	5	4,400	Do.
Pictor	1,529	15	11	7,562	Do.
Holyrood*	1,777	18	3	5,450	Do.
Urania	1,703	....		7,781	Loaded by Heath Cotton Co.
Cape Colonna	1,767	....		8,921	Do.
Sandhill	1,313	....		6,060	Do.
Tripoli	1,686	....		8,664	Do.
Total	....	....		122,266	

* This steamer came into Wilmington from Tampa, Fla., with 1,700 tons phosphate rock; was loaded at the wharves of Messrs. Alex. Sprunt & Son with 4,200 bales of cotton on top of the phosphate, putting her down to a draft of 18 feet and 3 inches. The vessel was then carried to Southport, there loaded with 1,250 additional bales, completing her cotton cargo of 5,450 bales, after which the steamer took on 445 tons of coal and proceeded to sea, passing over the bar with a draft of 20 feet 3 inches.

Freight transported.

Calendar year ending Dec. 31—	Tons
1869	220,0
1889	325.
1890	346,
1891	344,

Cape Fear below Wilmington.

APPROPRIATED.

Date.	Amount.	Aggregat
Mar. 2, 1829, to July 22, 1854		*$363, 228.
July 11, 1870	$100,000	100,000
Mar. 3, 1871	75,000	175,000.
June 10, 1872	100,000	275,000.
Mar. 3, 1873	100,000	375,000.
June 23, 1874	150,000	525,000.
Mar. 3, 1875	150,000	675,000.
Aug. 14, 1876	132,500	807,500.
June 18, 1878	160,000	967,500
Mar. 3, 1879	100,000	1,067,500.
June 14, 1880	70,000	1,137,500.
Mar. 3, 1881	140,000	1,277,500.
Aug. 2, 1882	225,000	1,502,500.
July 5, 1884	200,000	1,702,500.
Aug. 5, 1886	157,500	1,860,000.
Aug. 11, 1888	245,000	2,105,000
Sept. 19, 1890	170,000	2,275,000.
July 13, 1892	200,000	2,475,000.

* Balance of $3,728.07 turned over to surplus fund.

EXPENDED.

To June 30—		To June 30—	
1829 to 1858	$359,500.85	1882	$1,214,469.
1871	102,514.18	1883	1,334,107.
1872	177,950.67	1884	1,473,102.
1873	284,063.32	1885	1,632,358.
1874	377,048.45	1886	1,697,691.
1875	463,712.57	1887	1,773,946.
1876	652,277.28	1888	1,851,036.
1877	719,567.75	1889	1,903,924.
1878	806,941.76	1890	2,093,885.
1879	938,408.82	1891	2,159,534.
1880	1,042,390.55	1892	2,268,599.
1881	1,131,949.08		

L 20.

IMPROVEMENT OF LOCKWOODS FOLLY RIVER, NORTH CAROLINA.

The depth on the ocean bar is changeable, but at ordinary tides i usually about 4 feet at low and 8 feet at high water. These depth can be carried at those stages 1½ miles up the channel until the rive spreads to one-half to three-fourths of a mile in width over mud fla interspersed with beds of oyster rock, over which for fully 1½ miles th channel depth averages less than 1 foot at low water. From these fla over which vessels can carry 3½ feet at ordinary high water, they ca carry, except for 300 feet at Dixons Landing, 5 feet at low water up t

Lockwoods Folly Bridge, where there are a few houses, about 25 miles by river and 8 miles by land from the sea.

The project was adopted in 1887 to dredge a channel 100 feet wide and 7 feet deep at low water through the flats, at an estimated cost of $40,000.

More accurate surveys showed a considerable increase in the length of the cut through the flats (to 8,430 feet) and the necessity of dredging for 300 feet near Dixons Landing, where the depth is only 3½ feet at low water. With this increase, and after experience of the difficulty in getting a dredge to the site, the final cost is estimated at $65,000.

To June 30, 1893, $8,000 have been appropriated and $4,975.14 expended, and a cut 2,530 feet long, 40 feet wide, and 5 feet deep at low water has been dredged.

The amount ($3,000) appropriated July 13, 1892, being too small to enable a contract for dredging to be made at an advantageous price, the Secretary of War, August 4, 1892, authorized it to be withheld from expenditure for the present, and no work has been done during the fiscal year ending June 30, 1893.

The three small vessels to which the traffic on the river now gives employment could easily pass through a channel 40 feet wide and 5 feet deep at low water, which could be dredged at an estimated cost of $30,000.

The quantity of naval stores formerly shipped down the river has greatly diminished from the depletion of the long-leaf pine. The traffic of all kinds downstream is credibly reported to be now only about one-half as great in quantity and one-third as great in value as it was 20 years ago, when the condition of the channel was about as it is now.

The trade of the river is almost exclusively with Wilmington, where the Produce Exchange keeps a record of all receipts at the port and shipments from it. The accompanying commercial statistics for the calendar year 1892 have been carefully compiled by Assistant Engineer E. D. Thompson from the records of the exchange, from the statements of merchants who have the greater part of the Lockwoods Folly River trade, and of the masters of the vessels plying between the river and Wilmington.

From this statement it appears that the value of the products brought from the river during the year is $29,191 and of the merchandise and commodities taken up it $36,415, from which it seems that the community buys more than it sells. The total weight of produce and commodities brought down and carried up the river during the year is 2,361¼ tons, and their aggregate value is, as above, $65,606, just about equal to the estimated cost of the improvement.

The country upon which all traffic, except that in lumber, on the river, present and future, must depend is sandy and poor in character and small in area, lying between the Cape Fear River on the east, the Waccamaw River on the west, the ocean on the south, and the Green Swamp (from which the river flows), 11 miles to the north.

The extent to which lumber, of which there is a large quantity in the Green Swamp, would be shipped from the river were the improvement completed is somewhat problematical. The small depth on the bar excludes all coastwise vessels, which carry the larger cargoes at the cheaper rates, and the lumber, so far as it would go down the river, would, perhaps, continue to be shipped in small vessels to Wilmington and there reshipped by sea or rail to the north. Lumber is now sent from the Green Swamp by the Wilmington, Columbia and Augusta Railroad, which runs along its northerly side, and lumbermen are contemplating another outlet by narrow-gauge railroad and Town Cree to the Cape Fear River, accessible to vessels of 18-foot draft. Narro gauge railways like those built for like purpose in other parts of eas ern North Carolina, built a distance of 10 miles from the Cape Fea River to the swamp, will perhaps be the most advantageous outlet fo its lumber.

So far as Lockwoods Folly River would prove a useful outlet for an considerable quantity, the logs could be rafted down the river over th flats and sawed into lumber at mills that could be built at a good a chorage between the flats and the bar.

If the improvement is to be continued, work should not be resume until the sum of $25,000 becomes available, which would permit th first cut, 40 feet wide and 5 feet deep, to be completed entirely throug the flats, which, as before mentioned, could readily be navigated by th three vessels of 14, 17½, and 25 tons net register which now ply upo the river.

The river is in the collection district of Wilmington, N. C.

Money statement.

July 1, 1892, balance unexpended	$35.
Amount appropriated by act approved July 13, 1892	3,000.
	3,035.
June 30, 1893, amount expended during fiscal year	10.
July 1, 1893, balance unexpended	3,024.
Amount (estimated) required for completion of existing project	32,000.
Amount that can be profitably expended in fiscal year ending June 30, 1895	*22,000.
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

COMMERCIAL STATISTICS.

The commerce for the year ending December 31, 1892, is estimated as follows:

Class of goods.	Tons.	Class of goods.	Tons
Cotton	10½	Turpentine, crude and spirits of, and rosin	[illegible]
Tobacco	2		
Rice	18	Lumber and its products	1.
Grains	68	Fertilizers	[illegible]
Vegetables, including truck	63	Machinery	[illegible]
Live stock, including poultry	3	General merchandise	[illegible]
Meats and their products	22		
Fish and shellfish	270	Total	2,3
Tar	217		

Decrease since last year, 471½ tons.
Transportation lines established during year, none.

Freight transported.

Calender year ending Dec. 31.	Tons.
1890	7,
1891	2,

---

*No further money can be profitably spent upon this improvement, but if it is be continued $22,000 is the amount that can be most advantageously applied.

Lockwoods Folly River.

APPROPRIATED.

Date.	Amount.	Aggregate.
Sept. 19, 1890	$5,000.00	$5,000.00
July 13, 1892	3,000.00	8,000.00

EXPENDED.

To June 30:	
1891	$19.81
1892	4,964.32

L 21.

IMPROVEMENT OF YADKIN RIVER, NORTH CAROLINA.

This river and the location of the section under improvement are described on pages 1181, 1182 in the Annual Report of the Chief of Engineers for 1892.

The project of 1879 was to secure a minimum depth of 2½ feet at ordinary stages nine months annually throughout the 64½ miles next above the railroad bridge at Salisbury, by building wing dams and training walls and by cutting through rock and gravel bars, at an estimated cost of $400,000. The present project (of 1887) is to restrict the foregoing work to the 33 miles next above the railroad bridge at Salisbury, the cost of which is estimated at $107,000.

To June 30, 1893, $107,000 have been appropriated for and $102,808.91 expended upon the improvement.

No work has been done during the fiscal year ending June 30, 1893, and the improvement of the river has been stopped by authority from the Secretary of War of November 16, 1892, as shown and for the reasons explained in the following correspondence:

[Third indorsement.]

U. S. Engineer Office,
Wilmington, N. C., August 19, 1892.

Respectfully returned through the Division Engineer to the Chief of Engineers.

On the 17th instant, accompanied by Mr. Frank Brown, who has conducted all the work on the Yadkin River since the improvement was commenced in 1880, I passed in a skiff over the 33 miles of river under improvement and next above the railroad bridge near Salisbury.

Although the execution of the project has been far advanced and the prescribed depth of 2½ feet during 9 months annually has been obtained for a width of about 70 feet in the upper half of the 33 miles and for a width of about 40 feet in the lower half, no freight whatever has been yet carried upon that part of the river.

Excepting the ferry boats at the rope ferries at the country roads there are no boats of any description whatever upon the river, and no probability or expectation that any boats would be put upon it even were the project completed, especially since the extension during the last eighteen months of the railroad to Wilkesboro, on the Yadkin, about 80 miles by river above the upper limit of the improvement, and of a branch railroad to Mocksville, about 5 miles from the middle of the section under improvement.

I therefore respectfully recommend that no work be done on the Yadkin River under the appropriation of July 13, 1892, that its improvement be permanently discontinued, and that expenditures under the appropriation of September 19, 1890, be restricted to what is necessary for the care of the plant until it is disposed of or distributed to other works.

W. S. STANTON,
Major, Corps of Engineers.

[Sixth indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., November 11, 1892.

Respectfully returned to the Chief of Engineers after much delay, which could no be avoided. I have examined into this matter personally.

The portion of the Yadkin which has been under improvement by the United State has below it another stretch of a much more difficult character, where the declivit is so great that its improvement for boats of any character could only be accomplished at a very large expense, entirely out of proportion to any expected benefit Under these conditions, as a continuous navigation could not have been expected the improvement of the upper portion of the Yadkin could only have had in view i use as a feeder to transverse railroads to enable the people in the fertile region bordering the river to move their produce to market more cheaply than by teams ove bad roads. The situation is now quite changed. Branch roads have been built fro the main stem of the Richmond and Danville system and others are understood to b in contemplation. The improvement of the river has gone on slowly and intermittently and is not yet completed. The railroads have been rapidly put into operatio when it was decided to have them and they have taken the trade. The district engineer remarks, "There are no boats of any description whatever upon the river an no probability or expectation that any boats would be put upon it even were the project completed." He has not overstated the case.

If in the usual routine a report were called for after an examination, whether th river were now "worthy of improvement by the General Government," I would fe obliged to reply in the negative. I therefore concur in the recommendations whic conclude the third indorsement of the local engineer.

WM. P. CRAIGHILL,
Colonel, Corps of Engineers.

[Seventh indorsement.]

OFFICE CHIEF OF ENGINEERS,
U. S. ARMY,
November 12, 1892.

Respectfully submitted to the Secretary of War.

The river and harbor act of July 13, 1892, appropriates $5,000 for completing th improvement of the Yadkin River, North Carolina. As will be seen by referring t the third and sixth indorsements hereon the officer in charge of the improvement an the Division Engineer are of the opinion that the expenditure of this appropriatio would be of no material benefit to the interest of commerce. I concur in the view of these officers and recommend that no work be done on the Yadkin River under th appropriation of July 13, 1892, and that expenditures under the appropriation September 19, 1890, be restricted to what is necessary for the care of the plant.

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

[Eighth indorsement.]

WAR DEPARTMENT,
November 16, 1892.

Approved as recommended by the Chief of Engineers in the preceding indorsement.

By the order of the Secretary of War:

J. B. RANDOLPH,
Acting Chief Clerk.

[Ninth indorsement.]

OFFICE CHIEF OF ENGINEERS,
U. S. ARMY,
November 17, 1892.

Respectfully returned to Major W. S. Stanton, inviting attention to the sixt seventh, and eighth indorsements hereon.

When such record as may be necessary has been made this paper will be return to this office.

By command of Brig. Gen. Casey:

H. M. ADAMS,
Major, Corps of Engineers.

By authority from the Chief of Engineers of February 1, 1893, the plant pertaining to this improvement has been sold in part at public auction and in part to other works in the district, and the proceeds thereof, together with the balance of the appropriation, covered into the Treasury.

Money statement.

July 1, 1892, balance unexpended	$455.82
Received from sales	1,370.28
Amount appropriated by act approved July 13, 1892	5,000.00
	6,826.10
June 30, 1893, amount expended during fiscal year	1,264.83
July 1, 1893, balance unexpended	5,561.27

Yadkin River, North Carolina.

APPROPRIATED.

Date.	Amount.	Aggregate.
Mar. 3, 1879	$20,000	$20,000
June 14, 1880	20,000	40,000
Mar. 3, 1881	12,000	52,000
Aug. 2, 1882	25,000	77,000
Aug. 5, 1886	10,000	87,000
Aug. 11, 1888	10,000	97,000
Sept. 19, 1890	5,000	102,000
July 13, 1892	5,000	107,000

EXPENDED.

To June 30—		June 30—	
1881	$8,380.89	1887	$77,265.90
1882	34,064.80	1888	84,957.92
1883	44,128.11	1889	92,107.75
1884	53,701.40	1890	96,450.48
1885	62,276.05	1891	98,971.54
1886	68,615.90	1892	101,601.43

L 22.

IMPROVEMENT OF GEORGETOWN HARBOR, SOUTH CAROLINA.

The project was adopted in 1881 to dredge a channel 12 feet deep at ordinary low water, 200 feet wide, and about 2,850 feet in length through a shoal in Winyaw Bay at the mouth of the Sampit River and entrance to Georgetown Harbor, which is that part of the river immediately above its mouth, at a cost estimated in 1889, at $44,500.

To June 30, 1892, $32,141.12 had been expended at which date a channel to the depth of 12 feet with a minimum width of 130 feet had been obtained through the shoal.

November 7, 1892, contract was entered into with P. Sanford Ross to do the necessary dredging to complete the project at 22.7 cents per cubic yard, and at prices specified in the contract for the removal of stumps and logs.

Work under the contract was commenced December 7, 1892, and th project was completed January 10, 1893, at which date there was channel 200 feet wide and 12 feet deep entirely through the shoal the entrance to the harbor of Georgetown.

January 10 to 20, 1893, by authority from the Chief of Engineers the former date 6,974 cubic yards of sand and mud were dredged by th contractors from the point opposite the Palmetto Cypress Company' mill, about 700 yards above the river mouth.

During the fiscal year ending June 30, 1893, 31,856 cubic yards sand and mud were dredged, and 44 stumps and 8 logs removed.

The details of the work are given in the appended report of Assista Engineer Chas. Humphreys, who was in immediate charge of the improvement.

Georgetown is a port of entry.

Money statement.

July 1, 1892, balance unexpended	$374.
Amount appropriated by act approved July 13, 1892	12,000.
	12,374.
June 30, 1893, amount expended during fiscal year	10,103.
July 1, 1893, balance unexpended	2,271.

Abstract of proposals for dredging opened at 11 o'clock a. m., October 20, 1892, by M W. S. Stanton, Corps of Engineers.

No.	Name and address of bidder.	Price bid per cubic yard.	Remarks.
		Cents.	
1	Colin McK. Grant, Charleston, S. C	*40	With or without dike.
2	Charles G. Bochman, Charleston, S. C	†35 †37½	With dike. Without dike.
3	C. P. E. Burgwyn, Richmond, Va	*30	With dike.
4	American Dredging Co., Philadelphia, Pa	†25	With dike and with C Fear River dredging.
5	P. Sanford Ross, Jersey City, N. J	†22.7	With or without dike.

* Method of measurement bid on not stated. † In scows.

Awarded to bidder No. 5, P. Sanford Ross.
There is $12,000 available for work on this improvement.
Proposals invited for from $8,000 to $10,500 worth of work.

REPORT OF MR. CHARLES HUMPHREYS, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
June 30, 1893

MAJOR: I have the honor to submit this, my annual report of the improvement Georgetown Harbor, South Carolina, for the fiscal year ending June 30, 1893:

Surveys.—During September and October last a careful survey was made of channel and wharves from mouth of Sampit River to head of town limits for establishment of harbor lines, including the area to be dredged to complete the project of 1881; cost of survey, $343.60.

In November range targets were erected for alignment of dredging, costing $47

Contract work.—P. Sanford Ross began dredging under his contract December 1892, and finished January 20, 1893, removing from the channel (project of 1 24,882 cubic yards mud and sand, 44 cypress stumps, and 3 logs.

In addition to the above there were removed 6,974 cubic yards sand and 5 logs from a point opposite the Palmetto Cypress Company's mill, to widen the channel on account of a rather sharp turn at that place.

The prices paid for the above work under this contract were as follows: Sand and mud, scow measurement, 22.7 cents per cubic yard. Stumps over 12 inches diameter, mostly sound and embedded, $25 each, and logs over 18 feet long and 12 inches diameter, $15 each. The contractor thus earned $8,451.31.

There were employed on the work one clam shell dredge, three scows, and one tug boat.

While dredging was in progress, the channel was carefully swept and sounded to a low-water depth of 12 feet, and all obstructions found removed by the dredge. A map of the channel showing soundings after completion of dredging was made and sent you.

A meeting of the citizens and wharf-owners was held, and a drawing, indicating their wishes with regard to establishment of harbor lines, was forwarded to you.

Mr. John A. Dill was inspector on the dredge.

The cost of superintendence, inspection, dragging the channel, etc., was $838.94.

The channel is now 200 feet wide and 12 feet deep at low water. Vessels drawing 12 feet are now using it at low water.

Recommendations.—It is respectfully recommended that any funds available be reserved for future redredging of the 200-foot cut along its northern edge near Winyaw Bay, where a slight shoaling has been noticeable in the past, although at present there is full depth and width.

Commerce.—Vessels drawing 12 feet are no longer detained at Georgetown.

The commercial statistics for the calendar year ending December 31, 1892, were collected and estimated from the most reliable sources available by Mr. W. D. Morgan, president of the bank and mayor of Georgetown, and Mr. L. S. Ehrich, chairman board of trade, and president of the Palmetto Cypress Company, and mailed to you, together with statements of the tonnage, by the collector of the port and the Winyaw Bay pilots.

The annual report of 1892 gives the tonnage for the year, approximately, 157,521 tons; from the above statements it is now approximately 272,070 tons and is increasing.

Transportation lines established during the year, none.

Very respectfully, your obedient servant,

CHAS. HUMPHREYS,
Assistant Engineer.

Maj. W. S. STANTON,
Corps of Engineers, U. S. A.

COMMERCIAL STATISTICS.

List of vessels plying between Georgetown, S. C., and other ports during the year ending December 31, 1892.

Name.	Net tonnage.	Name.	Net tonnage.
STEAMERS.		SAILING VESSELS.	
Croatan	827	Eleanor	341.00
Pawnee	858	B. I. Hazard	372.00
Benefactor	637	Wacamaw	435.00
Fanita	289	Lina C. Kaminski	421.00
Alexander Jones	69.37	E. F. C. Young	108.00
W. A. Brewster	....	Demory Gray	382.00
Planter	499.16	James Beard	371.00
John M. Cole	318.41	Alfaretta S. Snare	241.00
Maggie	279.20	S. Warren Hall	152.31
Driver	111.08	J. W. Hall	329.27
Ruth	89.85	Eva A. Danenhower	216.69
Two Brothers	97.37	Aroesta	479.54
Maggie No. 2	72.63	Robert A. Snyder	357.14
Janey	17.21	Percy & Lillie	478.61
Emma	19.86	Clara A. Phinney	456.94
Merchant	405 55	City of Jacksonville	336.53
William P. Congdon	34.48	Abbi H. Gheen	253.31
S. S. Brewstar	59.61	John C. Gregory	360.29
Emma A. Twiggs	16.79	Minnie Bergen	368.50
William C. Turner	28.86	W. T. Parker	170.00
Fearless	18.92	Charles C. Lister	266.75
Henry Lloyd	13.01	Edgar C. Ross	379.78
Maria C	8.00	Nellie Floyd	434.72

List of vessels plying between Georgetown, S. C., etc.—Continued.

Name.	Net tonnage.	Name.
SAILING VESSELS—continued.		SAILING VESSELS—continued.
Warren B. Potter	349.92	Mary C. Brockaway
P. W. Schell	228.00	Rillie S. Derby
—— Wallingford	357.14	Ruth Shaw
Mark Gray	293.41	Lizzie V. Hall
John H. Cannor	220.47	Kate V. Aitkins
A. E. Rudolph	250.00	Red Wing
James Ponder	258.04	Ella Kimball
Edna & Emma	173.64	Andrew A. Gaskill
Jessie W. Starr	291.90	J. W. Hall, jr
E. A. Gaskill	233.44	Melvin
Hattie L. Sheets	175.41	Anna V. Lawson
Adele Ball	401.22	Encore
George Churchman	268.46	Prosperity
Henry H. Chamberlain	238.00	Longfellow
Etta	35.83	Bronx
Bacon (Addie B.)	371.12	Annie Wahab
Annie Ainsley	288.48	Etta
Thomas J. May	213.41	Chief
Frank McDonnell	263.86	Winyaw
Ettie H. Lister	212.35	

The commerce for the year ending December 31, 1892, is estimated as foll

Class of goods.	Tons.	Class of goods.
Cotton	2,500	Fish and shell fish
Rice	10,606	Lumber and its products
Vegetables, including truck	120	General merchandise
Live stock, including poultry	5	
Turpentine, crude and spirits of, and rosin	63,250	Total

Ten thousand five hundred passengers were carried during the year.

Freight transported.

Calendar year ending December 31—
1882
1888
1889
1890
1891

Georgetown Harbor, South Carolina.

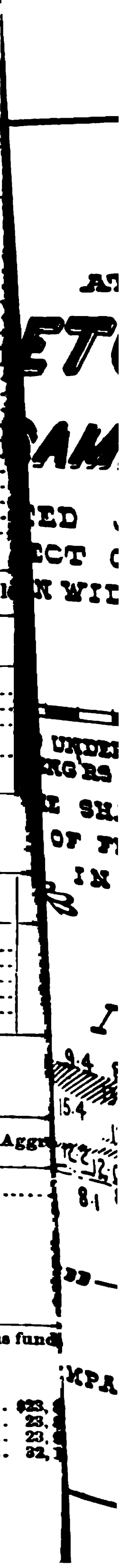
APPROPRIATED.

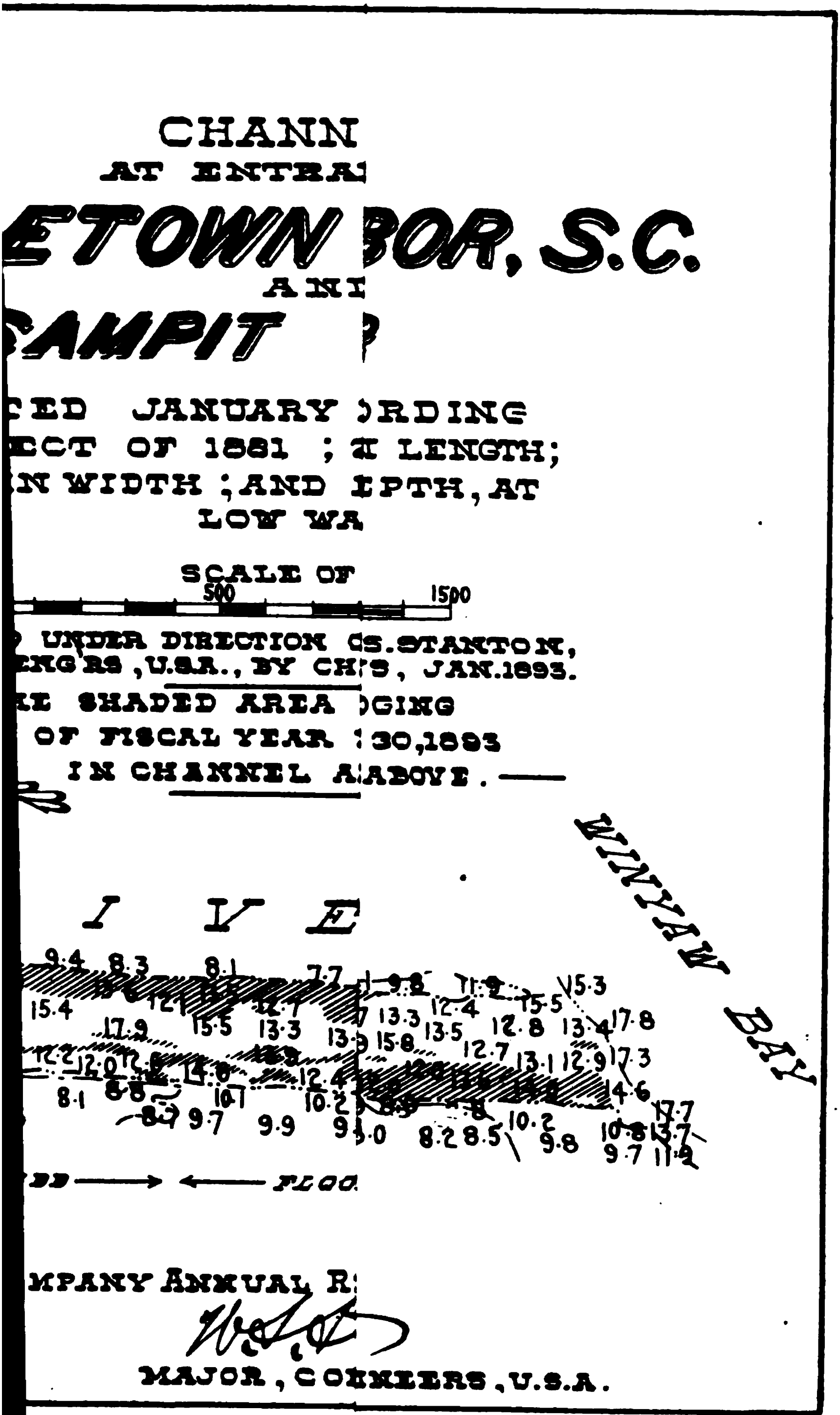
Date.	Amount.	Aggr
July 4, 1836	*$1,000	
Aug. 30, 1852	†3,000	
Aug. 2, 1882	7,000	
July 5, 1884	5,000	
Aug. 5, 1886	5,000	
Aug. 11, 1888	5,000	
Sept. 19, 1890	8,000	
July 13, 1892	12,000	

*Not used; turned over to surplus fund. †Balance of $0.03 turned over to surplus fund

EXPENDED.

To June 30—		To June 30—	
1853 to 1854	$2,999.97	1889	$23,
1885	8,433.85	1890	23,
1886	11,986.04	1891	23,
1887	16,622.50	1892	32,
1888	16,834.10		

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ENG'RS, U.S.A., BY CH'S, JAN. 1893.
E SHADED AREA DGING
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with Mr. Bochman, he has been required to keep the mattresses laid 500 feet in advance of the trestle and to drive the piles for the trestle through the mattresses and their stone ballast. The immediate and marked diminution in scour thus effected is shown by the longitudinal profile on sheet No. 1. For the last 400 feet the scour has not exceeded 5 feet and the mattresses have been laid in water not exceeding 7 feet deep where the depth was originally about 3 feet. So far as can yet be ascertained there is no subsidence of the jetty from a farther settling of the mattresses.

It is expected that Mr. Bochman's contract will be completed about July 10, 1893, when work upon the north jetty will be suspended until funds become available under another appropriation.

A contract with the Rittenhouse Moore Dredging Company, of Mobile, Ala., was entered into December 21, 1892, and approved January 4, 1893, for building an earth dike, about 11,000 feet long, on South Island, to prevent hurtful changes to the tidal regimen of the bay that would be caused by the overflow along about two miles of shore line at the immediate entrance to the bay, of an extensive marsh on its southerly side, and whose surface is about one foot below mean high water. The overflow has been hitherto prevented by a slight barrier or beach of sand, the vestige of a former range of sand dunes lying upon the edge of the marsh upon the shore line. The rapid erosion of this sand barrier has continued during the fiscal year and its entire destruction and the overflow of the entire 2 miles of marshy shore have been prevented by a trial section of the dike 255 feet in length, by temporary embankments of slight profile and sand-catching dikes, formed by packing brush between two rows of posts about 2½ feet apart, built behind a breach in the sand barrier or beach, which was carefully watched. With each widening of the breach the embankment or sand-catching dike was extended, and altogether 2,483 linear feet have been built. If the tide had been permitted to flow through the breach the narrow points of sand at each side of the breach would have worn rapidly away, speedily extending the breach over the entire 2 miles and permitting the overflow of the whole front of the dike, entailing disadvantage in its construction by keeping the material (already too wet, as it is taken from the marsh) saturated at the base of the dike at every tide. The trial section of the dike, built by hired labor, was made 10½ feet in height above the surface of the marsh with the expectation that its settling and the subsidence of the site would be about 18 inches, leaving the dike 9 feet high above the marsh but so wet is the material it settled (see section on sheet 3) 2.6 feet to a height of 7.9 feet above the marsh. It is in the most exposed part of the 11,000 feet of dike to be built, and the past winter was unusually heavy on the Atlantic coast; but the sea has had no effect upon it. It is so well protected by the 600 feet of foreland and 2½ miles of shoal in front.

The contract required the building of the dike to be commenced by January 17, 1893, but owing to the very unfavorable weather until April for towing a dredge along the Atlantic coast, and since that date to the contractors' tardiness, their two dredges are only now working their way through the creek leading from the bay to a point 170 feet from the site, whence the dredges must cut their way.

As it will be built, allowing 2 feet 10 inches for settlement to the height finally of 9 feet, its cross-section will contain 307.2 square feet. Its length is 10,900 feet, its volume before settlement 124,022 cubic yards, and the contract price 24 cents per cubic yard, amounting to an estimated cost of $29,765.28. After settlement at the rate the trial

At the date of this report there is a continuous channel of 18 to 20 feet depth with width varying from 270 to 74 feet from Wilmington 7 miles down to Logs and Big Island Shoal; thence 16 feet depth and 270 feet width 4½ miles to Lilliput Angle; thence for one-half mile the minimum depth is 14 feet for a width of 270 feet; thence 8 miles to New Snow's Marsh Cut 16 to 18 feet depth with width varying from 37 to 270 feet; thence 16 feet depth, with a width varying from 100 to 233 feet, 9 miles to the ocean bar, excepting 1,400 feet in length at Shoal A, in New Snow's Marsh Cut, where the depth is 14.2 feet in a channel 100 feet wide; and thence a least depth to sea of 16 feet in a channel varying from 100 to 1,000 feet in width, excepting on two short shoals, aggregating 100 feet in length where the least depth is, June 30, 15.2 feet.

The funds on hand are sufficient to dredge a continuous channel 18 feet deep and of a width varying from 75 to 100 feet from Wilmington to the bar by July 1, 1894.

The deepest laden vessel passing down the river to the ocean during the year was the steamship *Holyrood*, 1,777 tons, its draft being 13 feet 3 inches from Wilmington to Southport, and thence to sea 20 feet 2 inches.

Messrs. O. B. Fulford and Frank D. Perry, inspectors, Capt. J. W. Woodside, Robert C. Merritt, and Miss Florence Willis have had charge, respectively, of dredging operations, the *Woodbury*, surveys, and the clerical work. All have rendered very efficient service.

Very respectfully, your obedient servant,

E. D. Thompson,
U. S. Assistant Engineer.

Maj. W. S. Stanton,
Corps of Engineers, U. S. A.

COMMERCIAL STATISTICS.

List of steam vessels plying on Cape Fear River, N. C., at and below Wilmington, or regularly entering the port of Wilmington, N. C., during the fiscal year ending June 30, 1893.

Name of vessel.	Net tonnage.	Ports between which they ply and number of round trips made.
Blanche	47.12	Harbor and sea towing.
Alexander Jones	69.37	Do.
Italian	29.37	Do.
Compton	53.94	Harbor towing.
Marie	13.35	Do.
Lawrence	10.54	Harbor towing to October, 1892.
Charles Killam	6.66	Do.
Pastime	14.14	Pleasure boat.
Imperial	17.14	Harbor towing.
C. F. D.	4.00	Do.
F. and F.	9.10	Do.
Wilmington	110.09	1 daily trip to Southport, 8 months; 3 daily trips to Carolina Beach, 4 months.
Passport	42.83	1 daily trip to Southport, 3 months; 1 daily trip to Carolina Beach, 3 months.
Clarence	38.65	1 daily trip to Southport, 2 months.
Navassa	8.00	Harbor towing, 3 months.
Ida [illegible]	4.00	Pleasure boat.
Pender	14.03	Irregular trips up Northeast River and harbor towing.
W. T. Daggett	50.57	Semiweekly trips to Point Caswell to November, 1892.
Lisbon	66.94	Semiweekly trips to Clear Run.
A. P. Hart	140.11	Regular steamers between Wilmington and Fayetteville, N. C.; 4 trips per week each way to April, 1893; since then 2 round trips per week.
Cape Fear	156.32	
D. Murchison	140.72	
Pawnee	858.94	New York and Wilmington South Carolina Co.; 1 trip per week between New York and Georgetown, S. C., touching at Wilmington, N. C.
Croatan	827.25	
Pet	5.00	Harbor towing.
Messenger	7.34	Pleasure boat.
Elk	14.07	Semiweekly trips to Town Creek.
Lizzie L.	4.00	Pleasure boat.
Emily Gleaves	4.00	Harbor towing.

Commerce, foreign and domestic, for the year ending December 31, 1892.

[Itemized statistics furnished by Col. J. L. Cantwell, secretary of Wilmington Produce Exchang

Articles.	Quantity.	Rate.	Value.	Tonna
EXPORTS.				
Cotton .... bales..	151,520	$40.60	$6,157,712	37,
Spirits turpentine .... casks..	58,034	15.08	875,153	11,
Rosin .... barrels..	273,291	1.40	382,607	45,
Tar .... do...	69,091	1.70	177,455	11
Crude turpentine .... do...	16,216	1.90	30,810	2
Lumber .... M feet..	25,874	13.78	356,544	51,
Pitch .... barrels..	5,202	2.30	11,965	
Peanuts .... bushels..	102,291	.90	92,062	1,
Cotton goods .... packages..	1,818	150.00	272,700	
Yarns .... do...	218	80.00	17,440	
Paper stock .... do...	662	5.00	3,310	
Shingles .... per M..	10,274	5.50	56,507	4,
Spirits turpentine .... cases..	21	4.00	84	
Tar .... do...	2,629	2.00	5,258	
Miscellaneous (estimated)	....	....	4,250,000	56,
Total	....	....	12,689,607	224,
IMPORTS.				
Miscellaneous (estimated)	....	....	8,750,000	116,
Total exports and imports	....	....	21,439,607	341,
Total commerce of 1891	....	....	23,093,120	344,
Gain over last year	....	....	—1,653,513	—3,

Foreign commerce for 1892.

[Furnished by Mr. F. B. Rice, deputy collector of customs.]

Articles.	Quantity.	Value.	
		Exports.	Imports
Cotton .... bales..	125,182	$5,062,689	....
Rosin .... barrels..	256,912	358,939	....
Tar .... do...	7,068	12,049	....
Pitch .... do...	629	1,449	....
Spirits turpentine .... gallons..	982,977	284,877	....
Lumber .... M feet..	13,036	179,627	....
Shingles .... per M..	3,814	17,045	....
Miscellaneous	....	1,136	$120,54
Total	....	5,937,811	120,54

Statement of vessels of 100 tons and over at the port of Wilmington, N. C., for the ye ending December 31, 1892.

[Furnished by Capt. Joseph Price, harbor master.]

	Vessels.	Tons
American	185	84,
Foreign	109	68,
Total	294	152,

Tonnage of vessels of 100 tons and over for year ending December 31, 1892.

Vessels.	Foreign.		American.		Total.	
	No.	*Tons.*	*No.*	*Tons.*	*No.*	*Tons.*
Steamers	22	33,409	53	44,293	75	77,702
Barks	65	30,900	......	......	65	30,900
Brigs	11	2,750	5	1,538	16	4,288
Schooners	11	1,520	127	38,169	138	39,689
Total	109	68,579	185	84,000	294	152,579

Note.—No record is kept of vessels of less than 80 tons.

Entrances, clearances, and vessels documented for years ending December 31, 1891 and 1892.

[From custom-house records.]

	1891.	1892.
Foreign:		
Entrances	132	107
Clearances	191	162
American:		
Entrances	*124	*105
Clearances	*82	*70
Total	529	444
Vessels documented:		
Registers, vessels	......	23
Enrollment, vessels	......	10
Licenses over 20 tons	......	28
Licenses under 20 tons	......	26
Total	66	87

* These figures are complete as regards foreign vessels only. Vessels arriving from and departing to domestic ports are not compelled to enter and clear; therefore the number as above reported does not include all domestic vessels.

All the above vessels are of 100 tons and over.

Cotton steamers loaded at the port of Wilmington, N. C., during the year ending December 31, 1892.

[Furnished by Messrs. Alex. Sprunt & Son.]

Name of steamer.	Tonnage.	Draft, loaded.		No. of bales.	Remarks.
		Ft.	*In.*		
Bertha	1,083	16	9	4,700	Loaded by Alex. Sprunt & Son.
Torgorm	1,058	16	10	5,338	Do.
Smeaton Tower	880	16	7	4,000	Do.
Southwold	1,204	17	3	5,750	Do.
Leander	1,888	17	10	9,600	Do.
Hurworth	1,567	16	2	7,150	Do.
Maltby	1,803	16	5	9,000	Do.
Calliope	1,926	16	9	9,000	Do.
Ormsby	1,828	17	2	9,180	Do.
Headlands	1,932	17	5	9,710	Do.
Dora	937	15	5	4,400	Do.
Pictor	1,529	15	11	7,562	Do.
Holyrood*	1,777	18	3	5,450	Do.
Urania	1,703	......	......	7,781	Loaded by Heath Cotton Co.
Cape Colonna	1,767	......	......	8,921	Do.
Sandhill	1,313	......	......	6,060	Do.
Tripoli	1,686	......	......	8,664	Do.
Total	......	......	......	122,266	

* This steamer came into Wilmington from Tampa, Fla., with 1,700 tons phosphate rock; was loaded at the wharves of Messrs. Alex. Sprunt & Son with 4,200 bales of cotton on top of the phosphate, putting her down to a draft of 18 feet and 3 inches. The vessel was then carried to Southport, there loaded with 1,250 additional bales, completing her cotton cargo of 5,450 bales, after which the steamer took on 445 tons of coal and proceeded to sea, passing over the bar with a draft of 20 feet 3 inches.

Awarded to bidder No. 5, Charles G. Bochman.
There is $109,000 available for work on this improvement.
Proposals invited for from $60,000 to $70,000 worth of work.

Abstract of proposals for building an earth dike on South Island opened at 11 o'clock a m., October 20, 1892, by Maj. W. S. Stanton, Corps of Engineers.

No.	Name and address of bidder.	Price bid per cubic yard.	Remarks.
		Cents.	
1	John G. Smith, Charleston, S. C	44¾	Clause relating to GeorgetownHarbo erased.
2	Colin McK. Grant, Charleston, S. C	46	With or without.
3	Stewart Stone Co., Columbia, S. C	32	No reference to Georgetown Harbor.
4	C. P. E. Burgwyn, Richmond, Va	25	With Georgetown Harbor.
5	Marion Applegate, Charleston, S. C	44	No reference to Georgetown Harbor.
6	Charles G. Bochman, Charleston, S. C	35¼ 33⅓	Without Georgetown Harbor. With Georgetown Harbor.
7	American Dredging Co., Philadelphia, Pa	45	With Georgetown Harbor and Cap Fear also.
8	P. Sandford Ross, Jersey City, N. J	38	With or without.

All bids were rejected.
There is $109,000 available for work on this improvement.

Abstract of proposals for building an earth dike on South Island, opened at 11 o'clock m., November 30, 1892, by Maj. W. S. Stanton, Corps of Engineers.

No.	Name and address of bidder.	Price bid per cubic yard.	Remarks.
		Cents.	
1	Thomas L. Rosser, Charlottesville, Va	30	By hand.
2	Stewart Stone Co., Columbia, S. C	35	Do.
3	Rittenhouse Moore Dredging Co., Mobile, Ala	24	By dredge.
4	Charles G. Bochman, Charleston, S. C	27	Do.
5	P. Sanford Ross, Jersey City, N. J	28.95	By dredge and hand.

Awarded to bidder No. 3, Rittenhouse Moore Dredging Company.
There is $105, 000 available for work on this improvement.

REPORT OF MR. CHARLES HUMPHREYS, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
North Island, June 30, 1893.

MAJOR: I have the honor to submit this my annual report of the operations Winyaw Bay, South Carolina, for the fiscal year ending June 30, 1893.

STATEMENT OF WORK.

Hired labor work.—Surveys were made of Bottle Channel Bar in January with disclosing any change of depth on the bar. Surveys were also made around and front of the north jetty to determine the scour in advance of the mattresses and filling behind their outer end.

Surveys of the shore line on North Island have been made. The high-water line the east side of the jetty has advanced seaward 50 feet during the year and the hi water line on the west side 100 feet.

Contour surveys and maps of South Island near the sand hills at north end of m dike were made, also of Lagoon Creek.

A survey was made of the channel in Winyaw Bay opposite the mouth of Mosqu Creek to determine the available depth on shoal there. A channel 200 feet wi and 12 feet deep was found. Surveys were made to determine settlement and shri age of mud dike on South Island. Construction work on South Island mud dike beg in July and continued until October 22, when work was suspended on account of its excessive cost by hand labor. During that time the dike was built to full dimensions for a length of 255 feet and to partial dimensions for an additional length of [illegible] feet. Wings were built at each end toward the ocean, the south wing being 228 feet long and the one on the north 192 feet long. Slight repairs have been made three times since to that portion built to partial dimensions. No repairs have been made or needed to that portion built to full dimensions.

The sand beach has re-formed where it was washed away in front of the dike.

This work was done by hand, with shovels and wheelbarrows, and cost, exclusive of tools, quarters, etc., $5,723.87, containing 6,025 cubic yards of mud and requiring [illegible] cubic yards of sand excavation. That portion of mud dike built to full dimensions was 10¼ feet high, 62½ feet wide on base, and 3 feet wide on top.

From September to February the marsh under this portion of the dike had settled [illegible] feet, and the top of the dike had settled 2.6 feet. During January and February a brush dike was built just north of the mud dike and parallel with the beach, [illegible] feet long; it has caught a good deal of sand, which has partly washed away again during spring tides, although at present the beach is continuous in front of it. Cost of brush dike to date, $330.91.

Contract work.—Rittenhouse Moore Dredging Company began work on their contract on South Island mud dike on February 6, with a few laborers and continued until March 11, during which time 881 cubic yards of sand were removed and 2,380 linear feet of ditch at toe of dike were cut, when all work was suspended pending arrival of dredge.

The dredge *Pugh* entered Mosquito Creek in the early part of June, and is at present in Mosquito Creek Canal, about 200 feet north of the mouth of Lagoon Creek, on the way to the dike.

S. T. Gaynor continued work on the north jetty from July 1 to August 4, when his contract was finished.

During this interval he placed 1,278.37 tons of large stone, 4,875.86 tons of small stone, and 2,605.53 square yards mattresses, extending the mattresses and stonework from station 27+35 to station 29+75, the end of his trestle being at station 28+68.5.

His prices were $2.50 per ton of 2,000 pounds for small stone, and $2.90 per ton of 2,000 pounds for large stone, and 70 cents per square yard for mattresses; total earned by him in July and August, $17,720.67.

Charles G. Bochman began work under his contract January 27, 1893, and has continued to date, during which time he has placed 579.13 tons of 2,000 pounds of large stone, 17,021.86 tons of 2,000 pounds of small stone, and 13,036.38 square yards of mattresses. His prices are $2.70 per ton for large stone, $2.45 per ton for small stone, and $1.05 per square yard for mattresses. He has earned $56,955.40 and will probably complete his contract by the 10th of next month.

The mattresses placed by Mr. Bochman extend from station 29+75 to station 41+2[illegible], and the trestle built by him from 28+68.5 to station 34+22.

REMARKS.

The sand bottom in advance of the mattresses placed under Gaynor's contract scoured very much, due partly to the water jets used in sinking the sheet piles and trestle piles.

Maps showing original bottom and the bottom scoured in advance of the mattresses are inclosed.

During the stoppage of work from August 4, 1892, to January 27, 1893, this scour reached a depth of about 16 feet for a length of nearly 500 feet in advance of seaward end of last mat sunk by Gaynor. As the jetty built in this depth of water would greatly exceed in cost the Board's estimate per linear foot, it was considered very desirable to decrease this heretofore continuous scour if possible. Accordingly, in Mr. Bochman's contract a clause was inserted requiring the contractor to keep the mattresses 500 feet in advance of the superstructure, and if he built any trestle to drive the piles through the mattresses, each mattress extending the whole width of the foundation.

Sheet piles and oyster shells were omitted.

The trestle built under this contract to belong to the United States and no stone dumped outside of slopes and mattresses to be paid for.

The water jets being difficult to introduce through the mattress and its 2 or more feet of rock covering, were soon abandoned entirely, and the trestle piles were driven with the hammer alone. The penetration of the piles through the stone, mattress, and sand has been from 8 to 18 feet.

The piles are generally driven at low-water slack when the tide is rising on the bar; it is almost impossible to properly set the piles except at slack water, owing to the strong tidal current, and at high-water slack there is generally too much sea.

Under these conditions the trestle has been extended 553.5 feet witho
trouble; two piles have been driven 18 feet in one and a half hours. The r
favorable as regards scour in advance of the mattresses. Under the old m
mattresses were sunk in from 12 to 16 feet depth at low water and at prese
sinking the mats in 6 feet depth of water; but as the sand is scouring for a
of 800 feet at least in advance of the superstructure the mattresses shoul
1,000 to 1,500 feet in advance of the superstructure to obtain the best result
not observed any settlement in the mattresses after they are sunk nor have
tresses been lost after being accepted. During the next stoppage of work
able scour may be expected in advance of the last mattress. As the seaw
the superstructure advances this deep hole fills up gradually, shoaling mo
on the ocean or east side of jetty than on the west side.

All work completed has been well and substantially executed by the co

Ten thousand nine hundred and thirty-six and fifty-eight hundredth
small stone and 579.13 tons of large stone came from New York in sailing v
was unloaded at North Island and placed on the jetty via trestle by locom
dump cars; 1,278.37 tons of large stone and 10,961.14 tons of small stone
Columbia, Edgefield, etc., by railroad to Georgetown and thence by tu
lighters to the jetty. The New York rock is not suitable for large stone
the sea and should be excluded in the next specifications. Rock can be p
the trestle 300 days in the year and by lighters 200 days in the year.

The mattresses were made about 9 miles up Winyaw Bay and towed b
to within 2,000 feet of jetty and then dropped down with the ebb tide the
of the distance, there being a shoal to cross with 5 feet depth on it be
channel and jetty.

A mattress contains about 650 square yards. From four to five mats are
placed per month. Twenty-nine men and six mules have collected mat
built 3,055.55 square yards of mattress in one month.

The depth on the main channel bar remains about the same, 7 feet at lo
11½ feet at high tide.

EMPLOYÉS.

Mr. John A. Dill and Mr. Herman Bryan have had charge of all constructi
on the South Island dikes. Mr. Bryan has been the inspector on Mr. Bo
contract. Messrs. Dill and Bryan have rendered very efficient work.

COMMERCE.

Commercial statistics were compiled and estimated from the most reliable so
by Mr. W. D. Morgan, Mr. L. S. Ehrich, the collector at Georgetown, and th
pilots.

Very respectfully, your obedient servant,

Chas. Humphreys,
Assistant Engin

Maj. W. S. Stanton,
Corps of Engineers, U. S. A.

COMMERCIAL STATISTICS.

The commerce for the year ending December 31, 1892, is estimated as follows:

Class of goods.	Tons.	Class of goods.	To
Cotton	2,500	Fish and shell fish	4,
Rice	10,606	Lumber and its products	6
Vegetables, including truck	120	General merchandise	12
Live stock, including poultry	5		
Turpentine, crude and spirits of, and resin	63,250	Total	271

Ten thousand five hundred passengers were carried during the year.

SHEET 2.

s taken ANNUAL REPORT OF JUNE 30,1893.

MAJOR, CORPS OF ENGINEERS, U.S.A.

year. She can carry over the shoal, about three-fourths of a mile b low the bridge, about 11 tons with a draft of 3 feet, and has full ca goes to that draft about two months (November and December) a nually, but it is said to be usually able to carry all freight at ha each trip. During the other ten months she is said to have lig freights, less than she can carry. Last year she is reported to ha carried 300 bales of cotton. She carries down, besides cotton, a sm quantity of naval stores, eggs, and potatoes, and takes up mercha dise in return.

Edwards Mill is a village containing two stores and a few hous about 3½ miles by the creek and 2½ miles by a sandy road, above Bo ners Bridge. By the United States census the town of Edwards M contained in 1890 a population of 62.

The object of the improvement of the creek which the citizens of E wards Mills desire is to permit vessels or boats to ascend to within abo one-fourth of a mile of the village, and thus save 2¼ of the 2½ miles wagon transportation to and from Bonners Bridge for the freight whi they ship and receive by the schooner, and which cannot by the mo favorable statements (somewhat in conflict with those made at Bonne Bridge) exceed 10 tons each way weekly, and also to cheapen the tra portation on the corn produced and on the merchandise brought direc from Washington by the farmers in the adjacent sparsely settled count

As far as regards the character of the stream itself it would be wort of improvement to Bonners Bridge or even Ross Landing for vess of 5 feet draft. But its present condition up 4½ miles to Bonners Brid is adequate to all needs of commerce both present and at least in t near future. Its improvement 1½ miles farther to Ross Landing cutting through the dam and ameliorating perhaps two or thr bends, would not, owing to the topography, materially shorten the ha to Edwards Mill or benefit any interest to a degree worthy of consid ation; while the creek for the upper 2 miles through the swamp Edwards Mill is not worthy of any expenditure of public money.

Furthermore, the 5½ miles that are or could be navigated penetra so short a distance, only 5 miles from the Pamlico River, the benefit any application of public funds to the estuary would be restricted t very small section and, in a country so sparsely populated, to a sm number of people.

Beaufort County, in which this estuary is, had in 1890, by the Uni States census, a rural population (excluding the town of Washingt of about 25 per square mile. It produced in 1889, by the census, 5, bales of cotton on 15,887 acres, 221,659 bushels of corn on 19,350 ac and 27,227 bushels of oats on 2,523 acres, being one-third of a bale cotton, 10½ bushels of oats, or 11½ bushels of corn per acre. The ot cereals grown in the county were 475 bushels of wheat, 200 bushels buckwheat, and 20 bushels of rye.

The examination was made in detail by my assistant, First Lieut. W. Van C. Lucas, Corps of Engineers, November 10 to 14, and upon conclusion I ascended the estuary with him to Edwards Mill.

I am obliged to report that in my opinion Durhams Estuary from mouth to Edwards Mill is not worthy of improvement by the Gene Government.

Respectfully submitted.

W. S. STANTON,
Major, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. William P. Craighill, Corps of Engineers, Division Engineer, Southeast Division.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., November 26, 1892.

Respectfully submitted to the Chief of Engineers.

In view of the statements of the local engineer, I am of the opinion that this stream is not "worthy of improvement by the General Government."

WM. P. CRAIGHILL,
Colonel, Corps of Engineers.

L 27.

PRELIMINARY EXAMINATION FOR BREAKWATER TO PROTECT TOWN OF BEAUFORT, NORTH CAROLINA.

[Printed in House Ex. Doc. No. 246, Fifty-second Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., February 15, 1893.

SIR: I have the honor to submit the accompanying copy of report, dated February 13, 1893, by Maj. W. S. Stanton, Corps of Engineers, of results of preliminary examination for breakwater to protect town of Beaufort, N. C., made to comply with provisions of the river and harbor act approved July 13, 1892.

It is the opinion of Maj. Stanton, concurred in by the division engineer and by this office, that the locality is not worthy of improvement by the General Government in the manner proposed.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

Hon. S. B. ELKINS,
Secretary of War.

REPORT OF MAJ. W. S. STANTON, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., February 13, 1893.

GENERAL: Your letter of July 14 required me to make, pursuant to the river and harbor act of July 13, 1892, a preliminary examination for breakwater to protect town of Beaufort, N. C.

From Cape Lookout, 8 miles east of Beaufort, to Bogue Inlet, 22 miles west of it, the Atlantic coast trends approximately east and west. The entrance to Beaufort Harbor, Old Topsail Inlet, through the *cordon littoral*, 1½ miles wide.

Beaufort is on the main shore. Its water front, containing most of its stores and wharves, ranges about northwest by west and southeast by east, and is directly opposite and 1¾ miles due north from the inlet.

Southeasterly gales are the most violent, but infrequent and briefest in duration.

Between a line drawn from the northwesterly extremity of the town

year. She can carry over the shoal, about three-fourths of a mile b low the bridge, about 11 tons with a draft of 3 feet, and has full ca goes to that draft about two months (November and December) a nually, but it is said to be usually able to carry all freight at ha each trip. During the other ten months she is said to have lig freights, less than she can carry. Last year she is reported to ha carried 300 bales of cotton. She carries down, besides cotton, a sm quantity of naval stores, eggs, and potatoes, and takes up mercha dise in return.

Edwards Mill is a village containing two stores and a few hous about 3½ miles by the creek and 2½ miles by a sandy road, above B ners Bridge. By the United States census the town of Edwards M contained in 1890 a population of 62.

The object of the improvement of the creek which the citizens of E wards Mills desire is to permit vessels or boats to ascend to within ab one-fourth of a mile of the village, and thus save 2¼ of the 2½ miles wagon transportation to and from Bonners Bridge for the freight wh they ship and receive by the schooner, and which cannot by the m favorable statements (somewhat in conflict with those made at Bonn Bridge) exceed 10 tons each way weekly, and also to cheapen the tra portation on the corn produced and on the merchandise brought dire from Washington by the farmers in the adjacent sparsely settled count

As far as regards the character of the stream itself it would be wort of improvement to Bonners Bridge or even Ross Landing for vess of 5 feet draft. But its present condition up 4½ miles to Bonners Brid is adequate to all needs of commerce both present and at least in t near future. Its improvement 1½ miles farther to Ross Landing cutting through the dam and ameliorating perhaps two or th bends, would not, owing to the topography, materially shorten the ha to Edwards Mill or benefit any interest to a degree worthy of consid ation; while the creek for the upper 2 miles through the swamp Edwards Mill is not worthy of any expenditure of public money.

Furthermore, the 5½ miles that are or could be navigated penetra so short a distance, only 5 miles from the Pamlico River, the benefit any application of public funds to the estuary would be restricted t very small section and, in a country so sparsely populated, to a sm number of people.

Beaufort County, in which this estuary is, had in 1890, by the Unit States census, a rural population (excluding the town of Washingto of about 25 per square mile. It produced in 1889, by the census, 5,0 bales of cotton on 15,887 acres, 221,659 bushels of corn on 19,350 acr and 27,227 bushels of oats on 2,523 acres, being one-third of a bale cotton, 10½ bushels of oats, or 11½ bushels of corn per acre. The oth cereals grown in the county were 475 bushels of wheat, 200 bushels buckwheat, and 20 bushels of rye.

The examination was made in detail by my assistant, First Lieut. W. Van C. Lucas, Corps of Engineers, November 10 to 14, and upon conclusion I ascended the estuary with him to Edwards Mill.

I am obliged to report that in my opinion Durhams Estuary from mouth to Edwards Mill is not worthy of improvement by the Gene Government.

Respectfully submitted.

W. S. STANTON,
Major, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. William P. Craighill, Corps of Engineers, Division Engineer, Southeast Division.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., November 26, 1892.

Respectfully submitted to the Chief of Engineers.

In view of the statements of the local engineer, I am of the opinion that this stream is not "worthy of improvement by the General Government."

WM. P. CRAIGHILL,
Colonel, Corps of Engineers.

L 27.

PRELIMINARY EXAMINATION FOR BREAKWATER TO PROTECT TOWN OF BEAUFORT, NORTH CAROLINA.

[Printed in House Ex. Doc. No. 246, Fifty-second Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., February 15, 1893.

SIR: I have the honor to submit the accompanying copy of report, dated February 13, 1893, by Maj. W. S. Stanton, Corps of Engineers, of results of preliminary examination for breakwater to protect town of Beaufort, N. C., made to comply with provisions of the river and harbor act approved July 13, 1892.

It is the opinion of Maj. Stanton, concurred in by the division engineer and by this office, that the locality is not worthy of improvement by the General Government in the manner proposed.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

Hon. S. B. ELKINS,
Secretary of War.

REPORT OF MAJ. W. S. STANTON, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., February 13, 1893.

GENERAL: Your letter of July 14 required me to make, pursuant to the river and harbor act of July 13, 1892, a preliminary examination for breakwater to protect town of Beaufort, N. C.

From Cape Lookout, 8 miles east of Beaufort, to Bogue Inlet, 22 miles west of it, the Atlantic coast trends approximately east and west. The entrance to Beaufort Harbor, Old Topsail Inlet, through the *cordon littoral*, 1½ miles wide.

Beaufort is on the main shore. Its water front, containing most of its stores and wharves, ranges about northwest by west and southeast by east, and is directly opposite and 1¾ miles due north from the inlet.

Southeasterly gales are the most violent, but infrequent and briefest in duration.

Between a line drawn from the northwesterly extremity of the town

S. 19° 15′ E., to the easterly side of the inlet (tangent to Shacklefor
Point) and a line drawn from its southeasterly extremity to the wes
erly side of the inlet (tangent to Fort Macon Point), embracing 58½
from S. by E. ¾ E. to SW. ½ S., Beaufort is exposed through the inl
to the open sea except the important degree of protection given by th
extensive shoal extending, between the town and the inlet, from th
channel leading to North River, two miles easterly of Beaufort, to th
channel leading to Newport River, about a mile westerly from it.

The distance from the water front of the town to the 6-foot conto
on the northerly side of this shoal is 90 to 200 feet, and to the same co
tour on its southerly side 2,000 yards in the direction of Fort Mac
Point, and about 3,250 yards in the more southeasterly and most e
posed direction of Shackleford Point. In the former direction the sho
is bare at mean low water for a distance of 750 to 1,100 yards, and
submerged to a depth of not more than 1 foot for a further distan
of about 400 yards; while in the latter direction it is bare at low wat
for 700 to 900 yards and submerged not more than 1 foot for a furth
distance of about 1,000 yards.

On the crest of this shoal, between the town and the inlet, the dep
of water at high water is about 2 feet.

The bar channels and the shoals in the immediate vicinity are
shifting no soundings are given on the Coast Survey charts from t
shoal within the inlet seawards to 20 fathoms of water, but the 6, 1
and 18 foot contours outside the *cordon littoral* at either side of t
inlet are, respectively, about 3, 3¼, and 3½ miles from Beaufort. T
depth in the shifting channel on the bar is 15 feet.

On the shoal is a long narrow island of sand grown over with gra
its westerly extremity being 500 yards in front of the extreme easte
part of Beaufort, while 500 yards in front of the westerly half of t
town is a marshy island called Town Marsh. These two islands ve
upon the edges of the exposed sector above described.

The citizens of Beaufort desire a breakwater about 500 yards long
connect these two islands and close this sector, to protect the to
against the sea and to arrest the deterioration of the channel along
front, which they state has been long in progress and allege is cau
by the sand being washed into it from the shoal.

Beaufort is reported to have suffered considerable damage fr
storms in 1827, and twice between 1827 and 1879, but the amoun
damage caused by the sea during those three storms is not known.

The application for this breakwater is induced by the destructio
about fifteen buildings, including the Atlantic Hotel, situated al
the water front of the town, by a hurricane on the morning of Aug
18, 1879. The value of the property then destroyed is variously e
mated by the citizens at $45,000, $60,000, $75,000, and $140,000.

The hurricane occurred during spring tides. The wind was sou
east, and I am informed from the Weather Bureau at Washington t
by the records of the signal service station, then at Fort Macon
7:30 a. m. it attained a velocity of 100 miles per hour, and that the
rose 4 feet higher than usual high tide for the season. The follow
is an extract from an entry in the daily journal at the signal serv
station at Cape Lookout descriptive of the storm: "6:40 a. m.—A
mometer cups have blown away; self-registering showing a velocity
138 miles and wind increasing and sea rising." The observer repor
houses and chimneys blown down at Cape Lookout and small cr
blown through the air.

The damage at Beaufort was confined mostly to buildings that stood at the water's edge on the narrow space between the water line and the front street. On the landward side of that street three houses are reported to have been destroyed and several others more or less damaged. The water reached but a short distance beyond the street and did not cover the higher part of the front street itself. The hotel which was destroyed was at the eastern extremity of the town, on a flimsy foundation in the water 100 feet or more seaward of the high-water line.

Considering the exposed direction from which the wind came and its excessive violence, the restriction of the damage mostly to buildings so imprudently located well attests the degree of security given to the town by the shoals above described.

Excepting the site of the hotel, buildings have been rebuilt at the water's edge upon the site of those destroyed, although secure sites could doubtless have been found at no great distance from the wharves. If the owners of this property, in preference to safe, available sites, place it in so exposed a location at the water's edge for convenience to shipping, thereby incurring risk which insurance companies will not cover in seaboard cities, I do not see that money should be in any way applied by the United States for its protection.

A sea wall which has been built by the owners of this property along its front will give it a considerable measure of protection and could by a further application of their own funds give any additional protection that may be necessary.

The channel along the front of Beaufort extends easterly along the northerly side of Bird Island Shoal to Core Sound and North River. Through this channel, and Morse Slough at the east end of the shoal, vessels are said to have gone to sea from Beaufort 30 years ago, drawing 8 feet at high water.

A comparison of charts from surveys made in 1854, 1864, 1874, and 1887 shows extensive shoaling has been in progress since 1854, and that accretions to Bird Island Shoal have more than doubled its width above low water at its easterly end, extending it 900 yards northerly toward Horse Island, reducing the easterly entrance to the channel between the shoal and Horse Island from a width of 1,000 yards and greatest depth of 4 feet in 1854 to a width of 100 yards and depth of 6 inches in 1887. Immediately west of Horse Island, at the junction of the channels on each side of it, the width of the channel at low water was 1,860 feet in 1854 and 870 feet in 1887.

By a rough comparison, the cross section of the channel about a third of a mile east of Beaufort diminished 58 per cent between 1821 and 1885, or 50 per cent between 1854 and 1885, and the cross section at Beaufort diminished about 46 per cent between 1821 and 1885, the shoaling having extended throughout the channel.

While the flood tide flows easterly through this channel the ebb currents are unfavorable to its maintenance, entering at both ends and meeting a little east of Beaufort.

In 1821, according to Maj. Kearney's chart, Bird Island had not formed on Bird Island Shoal, then called Bird Shoal. On the chart of 1854 the island is shown three-eighths of a mile long, its easterly end being then about 2,100 yards southerly from the easterly extremity of Beaufort. In 1885 it had moved north 1,600 yards and extended easterly three-eighths of a mile, doubling its length and excluding the tide from overflowing the shoal for three-fourths of a mile, from the easterly extremity of Beaufort to Horse Island.

on the wharf at Mackeys Ferry, N. C., where they will be sold at pu lic auction July 25, 1893, pursuant to authority from the Chief of E gineers of January 12, 1893.

Concord.—In November, 1892, the agent of the Old Dominion Stea ship Company at Washington, N. C., complained that the steamer *bemarle*, belonging to that company, had recently struck heavily on obstruction in the channel of the Pamlico River, just below Washingto Immediate examination by dragging the channel located the obstr tion, which was reported by men long familiar with the locality to the remains of the wreck of the steamer *Concord*, which was sunk February, 1886, and a great part of which had been previously remov

It was reported to the Chief of Engineers November 2, 1892, to b dangerous obstruction to navigation, and November 26, 1892, its moval was authorized by the Secretary of War by United States hois and crew then employed in the river, and $500 were allotted for t purpose from the indefinite appropriation applicable under act of Ju 14, 1880, to the purpose.

But a few ships' knees and bolts were found, which, however, we jagged and dangerous obstructions. Their removal was completed D cember 6, 1892, at a cost of $54.20.

City of Long Branch.—In October, 1892, the steamer *City of Lo Branch* was burned and sank in the Roanoke River about 2 miles bel Williamston, N. C. The wreck, whose bow was above and stern b neath the surface of the water, projected into the channel.

January 9, 1893, the wreck, being a dangerous obstruction to navig tion and having remained "to the injury of commerce and navigati for a longer period than two months" was reported to the Chief of E gineers with application for an allotment of $750 and authority to move it by the United States hoister and crew at work in the river.

The application was approved by the Secretary of War January 1893, and the removal of the wreck, so far as it was an obstruction navigation, was completed March 23, 1893, at a cost of $539.54.

Wreck of United States gunboat, Cape Fear River.—The boiler of United States gunboat, sunk during the war on the bar at the entra to the Cape Fear River, lay in January, 1893, exactly on the line which the best channel through inner shoals on the bar, followin straight course from sea to river, had recently shifted. At mean l water the depth on the wreck was 13¼ feet, the present channel dep being 15.2 feet and the depth to be obtained by the project for impro ing the bar 18 feet.

The wreck was a dangerous obstruction both to navigation and the dredging of the bar by the United States Suction Dredge *Wo bury*.

January 3, 1893, its removal was authorized by the Secretary of W and an allotment of $3,500 made for the purpose from the perman indefinite appropriation, act of June 14, 1880.

Contract was entered into April 24 and approved May 13, 1893, wi Johnston & Townsend, of Somers Point, New Jersey, for the remov of the wreck for the sum of $2,234. The contractors commenced wo May 20 and completed the removal of the wreck to the depth of feet below mean low water June 27, 1893. The entire cost of its remov was $2,601.02. The details of the wreck and of the work will be fou in the appended report of Mr. E. D. Thompson, assistant engineer, immediate charge of it.

REPORT OF MR. E. D. THOMPSON, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., June 30, 1893.

MAJOR: I have the honor to submit the following report on "Removing sunken vessels or craft obstructing or endangering navigation" for the fiscal year ending June 30, 1893.

One wreck has been removed during the year, viz, that of a gunboat lying in the channel at the entrance to Cape Fear River, North Carolina. The steamer is stated to have been a wooden-hull vessel of about 100 tons and from 100 to 110 feet in length, employed by the Federal Government as a blockade cruiser and to have gotten aground in the position of the wreck one night in 1863. At daylight, being exposed to the fire of the Confederate batteries at Baldhead and Oak Island, the crew abandoned the boat after setting fire to her. For many years portions of the wreck were visible at low tide, but at various times since different parties had, by the use of explosives and other means, removed as much of the wreck as was profitable to them and left the remainder. Portions of the flues and shell of the boiler were also, in 1890, removed by the United States. The wreck had gradually sunk until, in 1893, it was covered by 13½ feet of water. Its position was such that it was considered expedient to remove whatever remained, as it interfered materially with the dredging done by the *Woodbury* on the bar channel.

Contract was approved May 20, 1893, and entered into with Messrs. Johnston & Townsend for the entire removal and disposal of the balance of the wreck. Under this contract work commenced May 20 and ended June 23. About 1,260 pounds of dynamite were used by them during the progress of the work and pieces of the boiler were taken up. No traces of the hull or machinery were found. The work was inspected on June 27 by First Lieut. E. W. V. Lucas. Soundings with an iron rod at the site of the wreck were carried to a depth of 22 feet below low water—as low as the rod could be forced through the sand. The locality was then examined by a diver. No traces or fragments of the wreck were discovered. Nothing of value was recovered or saved.

Very respectfully, your obedient servant,

E. D. THOMPSON,
U. S. Assistant Engineer.

Major W. S. STANTON,
Corps of Engineers, U. S. A.

Abstract of proposals for removing wreck of gunboat at entrance to Cape Fear River, opened at 11 o'clock a. m., April 8, 1893, by Maj. W. S. Stanton, Corps of Engineers.

No.	Name and address of bidder.	Price bid.
1	James T. Harper, Wilmington, N. C	$4,150
2	William H. Pike, Brunswick County, N. C	5,973
3	John G. Smith, Charleston, S. C	4,700
4	Johnston & Townsend, Lewes, Del	2,234
5	C. P. E. Burgwyn, Richmond, Va	6,900

Awarded to bidder No. 4, Johnston & Townsend.
There is $3,500 available for the work.

L 25.

PRELIMINARY EXAMINATION OF POTOHUNK RIVER, NORTH CAROLINA.

[Printed in House Ex. Doc. No. 207, Fifty-second Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., January 23, 1893.

SIR: I have the honor to submit the accompanying copy of report, dated January 17, 1893, upon preliminary examination of Potohunk River, North Carolina, made by Maj. W. S. Stanton, Corps of Engineers, in compliance with the provisions of the river and harbor act approved July 13, 1892.

It is the opinion of Major Stanton and the division engineer, concurred in by this office, that this river is not worthy of improvement by the General Government.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brigadier-General, Chief of Engineers.

Hon. S. B. ELKINS,
Secretary of War.

REPORT OF MAJ. W. S. STANTON, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., January 17, 1893.

GENERAL: I have the honor to submit the following report of a preliminary examination of the Potohunk River, North Carolina, made by me in person in compliance with a requirement of the river and harbor act of July 13, and with your letter of July 14, 1892.

The Potohunk flows into the Pasquotank River from its left or easterly bank, about 8 miles from Elizabeth City, which is above, on the other bank. When examined its depth in the pool at its mouth just above the sand flats was 4 feet, whence 3 feet could be carried about [illegible] miles to "Shipyard Landing," except at two short shoals about midway, on which the depth was 2 and 2½ feet respectively. From "Shipyard Landing," about 3,000 feet to the wagon bridge opposite, and about one quarter mile from the little village of Shiloh, only 2 feet could be carried. Its width is 20 feet at its mouth, nowhere exceeds 60 feet, and averages about 40 feet. Its banks are low, flat, swampy, and more or less timbered, and its bed soft mud. It has little current, is not affected by lunar tides, but occasionally, when easterly winds drive the water into the Pasquotank from Albemarle Sound, its depth is about 3 feet greater than when examined, and it then overflows its banks to a depth of about 2 feet. Immediately above Shiloh it divides into several branches.

At the Potohunk the Pasquotank is 2½ miles wide, with broad sand flats and very shallow water between its channel and banks. From the 6-foot contour the distance across the sand flats to the mouth of the Potohunk is not less than 1,400 feet and the water is not more than a foot deep for a fourth of the way.

About 1 mile above the Potohunk there is a long wharf built on piles over the sand flats from the left bank of the Pasquotank, at which vessels plying between Elizabeth City and Norfolk, via the lower Pasquotank, Albemarle Sound, and the Albemarle and Chesapeake Canal, touch to deliver merchandise for Shiloh and vicinity and receive the products of that section. The expense of maintaining this wharf makes the wharfage charges high, and landings at it in unfavorable winds are exposed and difficult, owing to the width and straight course of the Pasquotank for 7 miles above and about 6 miles below to the sound.

Four steamers, the *Lizzie Burrus*, *Tahoma*, *William B. Rogers*, and *Thomas Newton*, of 105.3, 80.76, 63.31, and 39.56 tons net tonnage, respectively, in plying on the Pasquotank or between Elizabeth City and Norfolk, touch at the wharf with a frequency, it is reported, amounting o about one landing daily, and sailing vessels also touch there occasionally.

The two larger of the foregoing steamers are reported to have landed at and received from the wharf about 400 tons of freight, all told, during the past year. The schooner *Ocoke*, of Plymouth, N. C., 26 tons' register, is also reported to have taken from the wharf during the same period 20,000 bushels of corn in eleven cargoes.

The improvement desired by those who are interested in the commerce of the locality is primarily the dredging of a channel 6 feet deep and 1,400 feet, or more, in length from the 6-foot contour in the Pasquotank to the 4-foot pool just within the mouth of the Potohunk, including the deepening of that pool to 6 feet to enable vessels to make at all times easy and secure landings in the Potohunk and avoid the expense of maintaining the long wharf which has become too much decayed to receive heavy freight, horses, or cattle. This cut would, doubtless, also be of some utility in giving small fishing vessels access to the Potohunk for shelter bound to or from Elizabeth City, the shipping point for their cargoes, but which, however, very seldom meet with disaster in the Pasquotank River.

The improvement sought embraces secondarily the deepening of the Potohunk 1.9 miles to Shiloh to save about 1½ miles of wagon transportation to the Pasquotank River.

Several citizens desiring this improvement report that were it made the Potohunk would be the shipping point for very nearly 18,000 acres of arable land, possessed by 190 landholders, divided as to crops somewhat as follows: 12,000 acres, producing annually 200,000 bushels of corn; 3,000 acres, yielding about 1,800 bales of cotton, and 3,000 acres "producing probably not less than $25,000 worth of truck."

The Potohunk is in the county of Camden, which has an area of 280 square miles. By the report of the United States Census of 1890 it then had a population of 5,667, and 6,274 in 1880, decreasing in the ten years 9.67 per cent. By the same report it produced in 1889, 244,353 bushels of corn on 22,634 acres, 9,585 bushels of oats on 1,157 acres, 204 bushels of wheat on 30 acres, and 1,240 bales of cotton on 4,155 acres, the number of acres tilled for these crops aggregating 27,976.

The southerly part of this county, between a third and a half of it, is a peninsula extending from Albemarle Sound on the south northerly between the Pasquotank on the west and North River, a part of the Albemarle and Chesapeake Canal route, on the east. (See U. S. Coast Survey Chart No. 10, edition of 1887, scale $\frac{1}{100,000}$.) The peninsula is only 7 miles wide at the Potohunk River and about 19 miles north from its narrow southern extremity is crossed by the Norfolk and Southern Railroad, about 37 miles from Norfolk.

Shiloh township has 1,773 inhabitants, somewhat the smallest of the three townships in the county and decreased 81 between 1880 and 1890. Shiloh has 110 inhabitants and is 1½ miles east from the Pasquotank, about 5¼ miles west from North River, about 8 miles north from Albemarle Sound, and about 8 miles south from the railroad, by which it is said products requiring quick transit are shipped to Norfolk.

The benefits of the desired improvement would be restricted almost wholly to the very limited territory circumscribed by the two rivers, the sound, and the railroad.

Near the Potohunk the left bank of the Pasquotank, while in places low and swampy, is in others for considerable distances 5 to 6 feet high and of sandy soil. At these latter places the banks are vertical, are being undermined, and are caving under the action of the waves in this broad and straight reach of the river, the sand from them being deposited on the flats through which, were the Potohunk to be improv the cut to its mouth would be dredged. A cut dredged through th sand flats would be crossed by the waves and currents caused by t winds up and down the Pasquotank, and I see no reason to believe th it could be maintained without repeated redredging.

Considering the very restricted and sparsely populated territory, sm number of people, and consequent commerce that would be benefit and the comparatively considerable cost of making and maintaini the improvement, in my opinion the Potohunk River is not worthy improvement by the General Government.

Respectfully submitted.

W. S. STANTON,
Major, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers U. S. A.

(Through Col. William P. Craighill, Corps of Engineers, Divisi Engineer, Southeast Division.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., January 19, 1893.

Respectfully submitted to the Chief of Engineers.

For the facts and reasons stated in the report of the local engineer is my opinion this stream is not worthy of improvement by the Gene Government.

WM. P. CRAIGHILL,
Colonel, Corps of Engineers.

L 26.

PRELIMINARY EXAMINATION OF DURHAMS ESTUARY, NORTH CAROLIN FROM MOUTH TO VILLAGE OF EDWARDS MILL.

[Printed in House Ex. Doc. No. 99, Fifty-second Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 5, 1892.

SIR: I have the honor to submit the accompanying copy of rep dated November 22, 1892, by Maj. W. S. Stanton, Corps of Enginee upon preliminary examination of Durhams Estuary, North Carolin from mouth to village of Edwards Mill, made in compliance with t terms of the river and harbor act approved July 13, 1892, together w report thereon by Col. William P. Craighill, Corps of Engineers, Division Engineer, Southeast Division.

Both these officers give the opinion that this stream is not worthy improvement by the General Government, and in this opinion I conc

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

Hon. S. B. ELKINS,
Secretary of War.

REPORT OF MAJ. W. S. STANTON, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., November 22, 1892.

GENERAL: In compliance with your letter of July 14, charging me with a preliminary examination, pursuant to a requirement of the river and harbor act of July 13, 1892, of "Durhams Estuary, North Carolina, from mouth to village of Edwards Mill," I have the honor to submit the following:

The estuary is a branch of the Pamlico River, on its right (southerly) bank, 16½ miles below the town of Washington, and is shown as Durhams Creek on Coast Survey Chart No. 144[1], whereon it is delineated from the mouth to within about one-half mile of Edwards Mill.

Its width narrows from about one-third of a mile at its mouth to about 500 feet 3 miles above, diminishing in the next mile and a half to about 125 feet at Bonners Bridge, and in another mile and a half to 40 to 50 feet at Ross Landing.

Throughout the 6 miles up to Ross Landing there is a good channel, diminishing in width from about 150 or 200 feet at the mouth to about 50 feet 4½ miles above at Bonners Bridge. The channel is obstructed only by a wagon bridge and the remains of a timber dam, both at Bonners Bridge, and is believed to have a mid-channel depth nowhere less than 6 feet at the usual stage, except upon a shoal of sand about 3¾ miles above the mouth, and approximately 400 feet long, upon which the least channel depth is 3 feet.

In the mile and a half from Bonners Bridge to Ross Landing there are six double bends, only two or three of which are so sharp as to be somewhat difficult for small vessels.

Were there anything whatever to call them to Ross Landing, small vessels could readily ascend to that point with a draft of 3 feet were a draw placed in Bonners Bridge and a section cut from the old dam, and with a draft of 5 feet were a cut about 400 feet in length to be dredged through the shoal.

The land on either side of the estuary is a ridge of sandy soil, timbered with pine or pine and oak. For the greater part of the 6 miles up to Ross Landing the stream is immediately bordered on either side by a marsh from a few to a hundred or more yards in width, but at occasional points the firm timbered land extends to the water's edge, forming "landings," such as Ross Landing, where logs are rolled into the water and made into rafts, which are poled to the lower part of the estuary, whence they are towed to the mills on the north bank of the Pamlico.

Up to Ross Landing the current is very sluggish, and there is little fluctuation in depth other than that caused by winds, which are said to cause sometimes an increase as great as 2 or 3 feet.

At Ross Landing the stream abruptly changes in character, and lies for 2 miles thence to the village of Edwards Mill in a somewhat thickly timbered cypress swamp. From a width of about 30 feet and a least depth of 3 feet just above the landing it diminishes to a width of 10 and a depth of 2 feet in the vicinity of the village. For the greater part of the 2 miles it is choked with logs, stumps, and snags, and is exceedingly tortuous, containing several bends so sharp as to considerably hamper a 20-foot skiff, and impracticable for navigation, even if cleared of snags, except by small pole boats.

The only point on the stream at which any freight is shipped or received by water is Bonners Bridge, where there are two stores and about fifteen houses. One vessel, the schooner *Louisa*, of 10.98 tons, plies between Bonners Bridge and Washington weekly throughout the year. She can carry over the shoal, about three-fourths of a mile b low the bridge, about 11 tons with a draft of 3 feet, and has full ca goes to that draft about two months (November and December) a nually, but it is said to be usually able to carry all freight at ha each trip. During the other ten months she is said to have lig freights, less than she can carry. Last year she is reported to ha carried 300 bales of cotton. She carries down, besides cotton, a sma quantity of naval stores, eggs, and potatoes, and takes up mercha dise in return.

Edwards Mill is a village containing two stores and a few hous about 3½ miles by the creek and 2½ miles by a sandy road, above Bo ners Bridge. By the United States census the town of Edwards M contained in 1890 a population of 62.

The object of the improvement of the creek which the citizens of E wards Mills desire is to permit vessels or boats to ascend to within abo one-fourth of a mile of the village, and thus save 2¼ of the 2½ miles wagon transportation to and from Bonners Bridge for the freight whi they ship and receive by the schooner, and which cannot by the mo favorable statements (somewhat in conflict with those made at Bonne Bridge) exceed 10 tons each way weekly, and also to cheapen the tra portation on the corn produced and on the merchandise brought direc from Washington by the farmers in the adjacent sparsely settled count

As far as regards the character of the stream itself it would be wort of improvement to Bonners Bridge or even Ross Landing for vesse of 5 feet draft. But its present condition up 4½ miles to Bonners Brid is adequate to all needs of commerce both present and at least in t near future. Its improvement 1½ miles farther to Ross Landing cutting through the dam and ameliorating perhaps two or thr bends, would not, owing to the topography, materially shorten the ha to Edwards Mill or benefit any interest to a degree worthy of conside ation; while the creek for the upper 2 miles through the swamp Edwards Mill is not worthy of any expenditure of public money.

Furthermore, the 5½ miles that are or could be navigated penetra so short a distance, only 5 miles from the Pamlico River, the benefit any application of public funds to the estuary would be restricted t very small section and, in a country so sparsely populated, to a sm number of people.

Beaufort County, in which this estuary is, had in 1890, by the Unit States census, a rural population (excluding the town of Washingt of about 25 per square mile. It produced in 1889, by the census, 5, bales of cotton on 15,887 acres, 221,659 bushels of corn on 19,350 acr and 27,227 bushels of oats on 2,523 acres, being one-third of a bale cotton, 10½ bushels of oats, or 11½ bushels of corn per acre. The oth cereals grown in the county were 475 bushels of wheat, 200 bushels buckwheat, and 20 bushels of rye.

The examination was made in detail by my assistant, First Lieut. E W. Van C. Lucas, Corps of Engineers, November 10 to 14, and upon i conclusion I ascended the estuary with him to Edwards Mill.

I am obliged to report that in my opinion Durhams Estuary from t mouth to Edwards Mill is not worthy of improvement by the Genel Government.

Respectfully submitted.

W. S. Stanton,
Major, Corps of Engineers.

Brig. Gen. Thomas L. Casey,
Chief of Engineers, U. S. A.

(Through Col. William P. Craighill, Corps of Engineers, Divisi Engineer, Southeast Division.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., November 26, 1892.

Respectfully submitted to the Chief of Engineers.

In view of the statements of the local engineer, I am of the opinion that this stream is not "worthy of improvement by the General Government."

WM. P. CRAIGHILL,
Colonel, Corps of Engineers.

L 27.

PRELIMINARY EXAMINATION FOR BREAKWATER TO PROTECT TOWN OF BEAUFORT, NORTH CAROLINA.

[Printed in House Ex. Doc. No. 246, Fifty-second Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., February 15, 1893.

SIR: I have the honor to submit the accompanying copy of report, dated February 13, 1893, by Maj. W. S. Stanton, Corps of Engineers, of results of preliminary examination for breakwater to protect town of Beaufort, N. C., made to comply with provisions of the river and harbor act approved July 13, 1892.

It is the opinion of Maj. Stanton, concurred in by the division engineer and by this office, that the locality is not worthy of improvement by the General Government in the manner proposed.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

Hon. S. B. ELKINS,
Secretary of War.

REPORT OF MAJ. W. S. STANTON, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., February 13, 1893.

GENERAL: Your letter of July 14 required me to make, pursuant to he river and harbor act of July 13, 1892, a preliminary examination for breakwater to protect town of Beaufort, N. C.

From Cape Lookout, 8 miles east of Beaufort, to Bogue Inlet, 22 miles west of it, the Atlantic coast trends approximately east and west. The entrance to Beaufort Harbor, Old Topsail Inlet, through the *cordon littoral*, 1½ miles wide.

Beaufort is on the main shore. Its water front, containing most of its stores and wharves, ranges about northwest by west and southeast by east, and is directly opposite and 1¾ miles due north from the inlet.

Southeasterly gales are the most violent, but infrequent and briefest in duration.

Between a line drawn from the northwesterly extremity of the town

S. 19° 15′ E., to the easterly side of the inlet (tangent to Shacklefor Point) and a line drawn from its southeasterly extremity to the wes erly side of the inlet (tangent to Fort Macon Point), embracing 58½ from S. by E. ⅝ E. to SW. ½ S., Beaufort is exposed through the inle to the open sea except the important degree of protection given by th extensive shoal extending, between the town and the inlet, from th channel leading to North River, two miles easterly of Beaufort, to th channel leading to Newport River, about a mile westerly from it.

The distance from the water front of the town to the 6-foot conto on the northerly side of this shoal is 90 to 200 feet, and to the same co tour on its southerly side 2,000 yards in the direction of Fort Mac Point, and about 3,250 yards in the more southeasterly and most e posed direction of Shackleford Point. In the former direction the sho is bare at mean low water for a distance of 750 to 1,100 yards, and submerged to a depth of not more than 1 foot for a further distan of about 400 yards; while in the latter direction it is bare at low wat for 700 to 900 yards and submerged not more than 1 foot for a furth distance of about 1,000 yards.

On the crest of this shoal, between the town and the inlet, the dep of water at high water is about 2 feet.

The bar channels and the shoals in the immediate vicinity are shifting no soundings are given on the Coast Survey charts from t shoal within the inlet seawards to 20 fathoms of water, but the 6, 1 and 18 foot contours outside the *cordon littoral* at either side of t inlet are, respectively, about 3, 3¼, and 3½ miles from Beaufort. Th depth in the shifting channel on the bar is 15 feet.

On the shoal is a long narrow island of sand grown over with gra its westerly extremity being 500 yards in front of the extreme easte part of Beaufort, while 500 yards in front of the westerly half of t town is a marshy island called Town Marsh. These two islands ve upon the edges of the exposed sector above described.

The citizens of Beaufort desire a breakwater about 500 yards long connect these two islands and close this sector, to protect the to against the sea and to arrest the deterioration of the channel along front, which they state has been long in progress and allege is cau by the sand being washed into it from the shoal.

Beaufort is reported to have suffered considerable damage fr storms in 1827, and twice between 1827 and 1879, but the amount damage caused by the sea during those three storms is not known.

The application for this breakwater is induced by the destruction about fifteen buildings, including the Atlantic Hotel, situated al the water front of the town, by a hurricane on the morning of Aug 18, 1879. The value of the property then destroyed is variously es- mated by the citizens at $45,000, $60,000, $75,000, and $140,000.

The hurricane occurred during spring tides. The wind was sou- east, and I am informed from the Weather Bureau at Washington th by the records of the signal service station, then at Fort Macon, a 7:30 a. m. it attained a velocity of 100 miles per hour, and that the t rose 4 feet higher than usual high tide for the season. The followi is an extract from an entry in the daily journal at the signal serv station at Cape Lookout descriptive of the storm: "6:40 a. m.—An mometer cups have blown away; self-registering showing a velocity 138 miles and wind increasing and sea rising." The observer report houses and chimneys blown down at Cape Lookout and small cr blown through the air.

The damage at Beaufort was confined mostly to buildings that stood at the water's edge on the narrow space between the water line and the front street. On the landward side of that street three houses are reported to have been destroyed and several others more or less damaged. The water reached but a short distance beyond the street and did not cover the higher part of the front street itself. The hotel which was destroyed was at the eastern extremity of the town, on a flimsy foundation in the water 100 feet or more seaward of the high-water line.

Considering the exposed direction from which the wind came and its excessive violence, the restriction of the damage mostly to buildings so imprudently located well attests the degree of security given to the town by the shoals above described.

Excepting the site of the hotel, buildings have been rebuilt at the water's edge upon the site of those destroyed, although secure sites could doubtless have been found at no great distance from the wharves. If the owners of this property, in preference to safe, available sites, place it in so exposed a location at the water's edge for convenience to shipping, thereby incurring risk which insurance companies will not cover in seaboard cities, I do not see that money should be in any way applied by the United States for its protection.

A sea wall which has been built by the owners of this property along its front will give it a considerable measure of protection and could by a further application of their own funds give any additional protection that may be necessary.

The channel along the front of Beaufort extends easterly along the northerly side of Bird Island Shoal to Core Sound and North River. Through this channel, and Morse Slough at the east end of the shoal, vessels are said to have gone to sea from Beaufort 30 years ago, drawing 8 feet at high water.

A comparison of charts from surveys made in 1854, 1864, 1874, and 1887 shows extensive shoaling has been in progress since 1854, and that accretions to Bird Island Shoal have more than doubled its width above low water at its easterly end, extending it 900 yards northerly toward Horse Island, reducing the easterly entrance to the channel between the shoal and Horse Island from a width of 1,000 yards and greatest depth of 4 feet in 1854 to a width of 100 yards and depth of 6 inches in 1887. Immediately west of Horse Island, at the junction of the channels on each side of it, the width of the channel at low water was 1,860 feet in 1854 and 870 feet in 1887.

By a rough comparison, the cross section of the channel about a third of a mile east of Beaufort diminished 58 per cent between 1821 and 1885, or 50 per cent between 1854 and 1885, and the cross section at Beaufort diminished about 46 per cent between 1821 and 1885, the shoaling having extended throughout the channel.

While the flood tide flows easterly through this channel the ebb currents are unfavorable to its maintenance, entering at both ends and meeting a little east of Beaufort.

In 1821, according to Maj. Kearney's chart, Bird Island had not formed on Bird Island Shoal, then called Bird Shoal. On the chart of 1854 the island is shown three-eighths of a mile long, its easterly end being then about 2,100 yards southerly from the easterly extremity of Beaufort. In 1885 it had moved north 1,600 yards and extended easterly three-eighths of a mile, doubling its length and excluding the tide from overflowing the shoal for three-fourths of a mile, from the easterly extremity of Beaufort to Horse Island.

From 1821 to 1854 the average of the deepest soundings in the channel opposite Beaufort decreased 1.2 feet (9.8 to 8.6) and opposite Bird Island about one-third of a foot to 4.2 feet; from 1854 to 1880 it decreased opposite Beaufort 1.3 feet (8.6 to 7.3 feet), and opposite the island increased 0.8 foot 4.2 to 5 feet); 1880 to 1885 it diminished hardly perceptibly at Beaufort but diminished 1.8 feet opposite the island (5 to 3.2 feet); 1885 to 1893 it diminished at Beaufort 0.8 foot (7.2 to 6[illegible] feet).

The mean rise and fall of the tide at Beaufort is 2.7 feet. At high water the depth of water on the crest of the shoal on the line of the desired breakwater is about 2 feet; at low water it is bare from Bird Island to the narrow channel round the easterly side of Town Marsh. A considerable current sets across the proposed site during the ebb.

Were the interval between Bird Island and Town Marsh to be closed while it would restrict to the entrance between Beaufort and Town Marsh the ingress and egress of the tide to and from the westerly part of the deteriorating channel, the changes in the currents might not be altogether favorable, inasmuch as the reduced capacity of the channel admitting the flood west of Bird Island might induce a flood current to set in at its easterly entrance, the two flood currents (from the west and east) meeting, as do now the two ebb currents, between Beaufort and Horse Island, from which point the ebb might set in opposite directions. The flow and ebb to and from the tidal basin embraced between the breakwater and Bird Island on the south and Beaufort on the north would be nearly at right angles with and might be hurtful to the channel now being improved which leads from the Bulkhead Channel first easterly and then northerly between Pivers Island and Beaufort to the anchorage at the confluence of Gallants Channel and Town Creek.

The deteriorating channel is used by small craft carrying fish, oysters, and merchandise between Beaufort and New River, and enables them to avoid the longer route around the south side of the shoal and the exposure it entails to the seas setting in from the inlet in rough weather.

Its improvement by dredging, where necessary, from Beaufort to North River was embraced in the project of 1881 for the improvement of Beaufort Harbor, but suspended by the project of 1887.

It is used as an anchorage by most of the vessels bringing cargoes to the town, but in southerly to southwesterly gales which blow on to the wharves it is too exposed for vessels to lie at the wharves or at anchor. The breakwater would be a quarter of a mile to the windward, in such gales, of the wharves and narrow anchorage.

The anchorage in Gallants Channel is excellent and well sheltered from all directions, with a good depth of water to the wharves at the westerly end of the town, which, when the present project for the improvement of Beaufort Harbor is completed, can be reached by vessels drawing 7 feet at low water.

This anchorage, with the improved channel to it, although less advantageous to the owners of property along the southerly front of the town, is ample for the small commerce of Beaufort with its 2,000 inhabitants.

In my opinion the building of a breakwater from Bird Island to Town Marsh, either to protect the town of Beaufort or to preserve the channel along its southerly front, is not a worthy improvement to be made by the General Government.

The channels and islands mentioned herein will all be found on the Coast Survey chart of Beaufort Harbor, No. 420.

Respectfully submitted.

W. S. STANTON,
Major, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. William P. Craighill, Corps of Engineers, Division Engineer, Southeast Division.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., February 14, 1893.

Respectfully submitted to the Chief of Engineers.

For the reasons stated by the local engineer, I do not consider the improvement herein reported upon to be one that should be undertaken by the General Government.

WM. P. CRAIGHILL,
Colonel, Corps of Engineers.

APPENDIX M.

IMPROVEMENT OF WACCAMAW AND LUMBER RIVERS, NORTH CAROLINA AND SOUTH CAROLINA, AND OF CERTAIN RIVERS AND HARBORS IN SOUTH CAROLINA.

REPORT OF CAPT. FREDERIC V. ABBOT, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1893, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Waccamaw River, North Carolina and South Carolina.
2. Lumber River, North Carolina and South Carolina.
3. Little Pedee River, South Carolina.
4. Great Pedee River, South Carolina.
5. Clark River, South Carolina.
6. Mingo Creek, South Carolina.
7. Santee River, South Carolina.
8. Wateree River, South Carolina.
9. Congaree River, South Carolina.
10. Harbor at Charleston, S. C.
11. Ashley River, South Carolina.
12. Wappoo Cut, South Carolina.
13. Edisto River, South Carolina.
14. Salkahatchie River, South Carolina.
15. Beaufort River, South Carolina.
16. Removing sunken vessels or craft obstructing or endangering navigation.

EXAMINATION.

17. Lynch River, South Carolina.

UNITED STATES ENGINEER OFFICE,
Charleston, S. C., July 4, 1893.

GENERAL: I have the honor to transmit herewith the annual reports for the fiscal year ending June 30, 1893, for the works of improvement of rivers and harbors which have been in my charge.

Very respectfully, your obedient servant,

FREDERIC V. ABBOT,
Captain of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

M 1.

IMPROVEMENT OF WACCAMAW RIVER, NORTH CAROLINA AND SOUT CAROLINA.

REFERENCE TO PAST REPORTS.

For preliminary examination see page 848, Annual Report for 188 For map of river see page 1200, Annual Report for 1889.

ORIGINAL CONDITION.

In 1880 this stream was navigable for 12-foot boats at all stages water from Georgetown 23 miles to Bull Creek, and at high water miles farther to Bucks Lower Mills; thence for 7-foot draft boats high water 22 miles farther to Conway; thence it possessed an o structed channel for 3-foot draft boats at ordinary winter water miles to Reeves Ferry; thence an obstructed channel with 3 feet high water for 30 miles to Lake Waccamaw.

PLAN OF IMPROVEMENT.

The project provides for a channel 12 feet deep at all stages of wate with 80 feet bottom width, from the mouth of the river to Conwa thence a cleared channel to Lake Waccamaw, at an estimated cost $138,400.

WORK PRIOR TO JUNE 30, 1892.

At eight shoals jetties made of piles and plank were put in. Th river had been snagged between points no miles and 117 miles abov the mouth since June 30, 1884, 19,179 obstructions having been r moved. Before June 30, 1884, the records are not detailed enough give exact figures. Dividing the total expenditures for all purpos between June 30, 1884, and June 30, 1892, by the above number of o structions removed, shows the average cost for that period to hav been $2.55 for each obstruction.

WORK OF PAST YEAR.

Work was carried on from January 20, 1893, to March 4, 1893, with hoister hired from Mrs. Mary A. Daggett; since then with United Stat plant and hired labor. Before January 20 United States plant w employed. The river has been quite thoroughly cleared for a width 40 feet and depth of 3 feet at low water between points 31 miles and 1 miles above the mouth. The average cost of removing obstructio was 68 cents each. For details of work done and commercial statisti reference is made to the report of my assistant engineer, Mr. Re Whitford, who has shown his usual ability in conducting the work.

Mr. Thomas W. Daggett, who has been connected with all the wor on this river, died on January 10, 1893. He has done most thoroug and faithful work.

REMARKS.

No new transportation line has been established on this river durin the year.

With the balance of $4,801.30 on hand July 1, 1893, snagging wi be continued, the worst obstructions being removed first.

During the year the freight passing over this stream has aggregated 70,976 tons.

This river is tributary to the collection district of Georgetown, S. C. Georgetown is its port of entry. Amount of duties collected in the calendar year of 1892, $14.82.

For this improvement the following appropriations have been made:

By act of Congress—	
Approved June 14, 1880	$15,000
Approved March 3, 1881	10,000
Passed August 2, 1882	4,400
Approved July 5, 1884	6,000
Approved August 5, 1886	15,000
Of August 11, 1888	15,000
Approved September 19, 1890	12,500
Approved July 13, 1892	10,000
Total	87,900

Total expenditures, including June 30, 1893, $83,098.70.

Money statement.

Amount appropriated by act approved July 13, 1892	$10,000.00
June 30, 1893, amount expended during fiscal year	5,198.70
July 1, 1893, balance unexpended	4,801.30
July 1, 1893, outstanding liabilities	436.84
July 1, 1893, balance available	4,364.46
Amount (estimated) required for completion of existing project	50,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	30,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

REPORT OF MR. REID WHITFORD, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Georgetown, S. C., June 30, 1893.

SIR: I have the honor to report as follows on Waccamaw River, North and South Carolina, for fiscal year ending June 30, 1893:

Work of snagging and clearing banks begun November 16, 1892, by United States steam hoister, and on January 20, 1893, this snag boat was removed to another stream, and operations were continued on the Waccamaw by using a steam hoister, hired from Mrs. Mary A. Daggett, which was being repaired from January 1st to January 20, 1893. The crew was supplied by the United States. After snagging till March 3, 1893, the boiler failed; work has been continued since by hand-hoister plant belonging to the United States. Operations were carried on from mouth of river to 121 miles, maintaining the previously cleared channel below Conway and extending the improvement above that place. The following total number of obstructions were removed, thoroughly clearing the channel from mouth of river to 31 miles to an approximate width of 80 feet and depth of 12 feet, and from 31 miles to 121 miles to width of 40 and depth of 3 feet at low water: From the channel: Logs, 1,319; stumps, 320; large snags, 669; small snags, 9 cords. From the banks: 1,842 trees cut, 79 cords brush cut.

Of the total amount expended, six-tenths were used on the channel and four-tenths on banks. Each obstruction cost approximately 68 cents.

The owners and captains of the steamers express themselves as being highly pleased with the work.

RECOMMENDATIONS.

It is respectfully recommended that work be carried on above Conway as it has been this year, with probably some dredging which may be necessary, and the existing width and depth below Conway be maintained at least.

COMMERCE.

The following statement was made up from the best information that could be obtained from Mr. D. T. McNeill, general agent and treasurer Waccamaw Line Steamers; Messrs. W. L. Buck & Co., lumber and shingle dealers; and Messrs. P. R. Lachicotte & Sons, rice millers. There are other freights on the Waccamaw River, but it was impossible to get any approximate estimate of them, as they are carried by pole boats and small craft of which no account was kept:

	1891.			1892.		
	Number.	Tons.	Value.	Number.	Tons.	Value.
Outward freights.						
Rosin .... barrels..	76,000	13,300	$228,000	78,000	15,600	$156,[illegible]
Tar .... do....	557	56	1,114	407	81	[illegible]
Spirits turpentine .... do....	12,000	2,250	240,000	14,000	2,800	220,[illegible]
Turpentine, crude .... do....	6,000	840	15,000	4,000	600	8,[illegible]
Cotton .... bales..	5,500	1,375	275,000	5,000	1,250	175,[illegible]
Timber .... sticks..	9,547	14,326	40,980	10,640	19,152	53,[illegible]
Lumber .... feet..	8,800,000	18,333	132,000	9,000,000	15,000	117,[illegible]
Shingles	9,800,000	4,900	78,400	9,200,000	4,600	73,[illegible]
Rough rice .... bushels..	122,000	2,684	152,500	155,100	2,806	178,[illegible]
Rice, clean .... barrels..	12,000	1,950	195,000	15,508	2,714	271,[illegible]
Miscellaneous articles, tallow, eggs, wax, game, poultry, etc..	....	1,231	123,118	....	1,500	75,[illegible]
	....	61,245	1,481,112	....	66,103	1,328,[illegible]
Inward freights.						
General merchandise	....	15,000	750,000	....	17,000	850,[illegible]
Total	....	76,245	2,231,112	....	83,103	2,178,[illegible]

	1893.		
	Number.	Tons.	Value.
Outward freights.			
Rosin .... barrels..	53,167	10,633	$106,[illegible]
Spirits, turpentine .... do....	10,893	2,179	163,[illegible]
Crude turpentine .... do....	1,330	266	2,[illegible]
Tar .... do....	1,238	248	2,[illegible]
Cotton .... bales..	17,230	4,307	603,[illegible]
Rough rice .... bushels..	195,279	4,491	195,[illegible]
Rice, clean .... barrels..	19,945	3,490	299,[illegible]
Rice flour .... bushels..	25,000	250	7,[illegible]
Hides .... bales..	3	1	[illegible]
Wool .... do....	5	1	[illegible]
Clams .... barrels..	2,121	424	8,[illegible]
Fish .... do..	363	19	[illegible]
Lumber .... feet B. M..	6,700,000	11,167	100,[illegible]
Timber .... pieces..	10,000	20.000	50,[illegible]
Shingles	7,000,000	3,500	56,[illegible]
Inward freights.	....	60,976	1,595,[illegible]
General merchandise	....	10,000	500,[illegible]
Total	....	70,976	2,095,[illegible]

This shows a decrease over last year's statement, owing principally to depression in the lumber and shingle trade, and very low water in upper Waccamaw, causing freights to be hauled across country to small sea-coast inlets and carried thence to Wilmington, N. C., by sailing craft, as well as the fact that the inward freights on the Great Pedee last year were added to those of the Waccamaw. It was true that those bound for the Great Pedee pass over the first 30 miles of the Waccamaw before entering the former river, but for fear that this might be misleading to those interested in the commerce of the Waccamaw, the freights in question were left off the Waccamaw statement. The commerce has been carried on by sea-going vessels of about 300 to 400 tons and steamers of 15 to 300 tons. The following extract from letter of Mr. D. T. McNeill explains itself:

CONWAY, S. C., *June 3, 1893.*

DEAR SIR:

*   *   *   *   *   *   *

You will notice that there has been a slight falling off in amount of naval stores handled. This falling off is owing to the fact of the stringency of money, etc.; and during the very low water which prevailed with us from September to latter part of January turpentine operators were forced to haul their naval stores across to Little River, S. C., and Shallotte, N. C., in order to get them to market.

We are pleased to state that the work you have had done, and are now having done, on upper Waccamaw has given entire satisfaction. Where it took us a week to make a trip before you began the work on the river, we can now run night or day and can make from three to four trips a week with perfect safety. We are now able to make a trip up the river on a stage of water 18 inches lower than we could a few years ago. We think that with another good appropriation for the Waccamaw and a continuance of your prudent management we see no reason why all obstacles could not be removed, and we be able to bring all naval stores made on the river on any stage of water, and we can then go higher up the river and do away with lighters entirely.

Yours, very truly,

D. T. MCNEILL,
General Agent and Treasurer.

Mr. REID WHITFORD,
U. S. Assistant Engineer.

EMPLOYÉS.

Much credit is due Mr. B. T. Daggett, overseer, and C. J. Banta, timekeeper, for their usual efficient and satisfactory work.

Very respectfully, your obedient servant,

REID WHITFORD,
Assistant Engineer.

Capt. FREDERIC V. ABBOT,
Corps of Engineers, U. S. A.

COMMERCIAL STATISTICS.

Arrivals and clearances of vessels and commerce at Georgetown, S. C., from January 1, 1888, to December 31, 1890.

ARRIVED.

Year.	Coastwise.			Foreign ports.						Total.		
				American vessels.			Foreign vessels.					
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.
1888......	352	124, 155	2, 818	2	479	14	1	81	8	355	124, 715	2, 840
1889......	365	128, 705	2, 920	2	424	10	1	149	7	368	129, 278	2, 943
1890......	385	165, 785	3, 150	6	1, 346	42	1	106	6	392	167, 237	3, 198
1891......	420	191, 651	4, 035	1	245	7	2	292	14	423	192, 188	4, 056
1892......	453	215, 087	4, 610	1	249	7	2	439	14	456	215, 775	4, 631

CLEARED.

1888......	342	121, 715	2, 735	8	1, 835	55	1	81	8	351	123, 631	2, 708
1889......	357	126, 965	2, 856	6	1, 494	45	1	149	7	364	128, 608	2, 908
1890......	372	160, 458	3, 069	9	1, 978	63	2	355	13	383	162, 791	3, 145
1891......	384	164, 562	3, 980	9	2, 719	69	1	149	7	394	167, 420	4, 062
1892......	396	187, 963	4, 094	5	1, 173	33	3	537	19	404	189, 673	4, 146

Commerce, foreign and domestic.

Year.	Value of exports.	Value of imports.	Duties collected.
1888	$3,125,000	$2,750,000	$32.4[illegible]
1889	3,265,000	2,975,000	....
1890	3,454,000	3,175,000	60.5[illegible]
1891	3,291,407	6,895,000	11.6[illegible]
1892	3,989,040	7,347,568	14.[illegible]

Total commerce, 1888	$5,875,[illegible]
Total commerce, 1889	6,240,[illegible]
Total commerce, 1890	6,629,[illegible]
Total commerce, 1891	9,809,[illegible]
Total commerce, 1892	11,336,[illegible]

R. O. BUSH.

M 2.

IMPROVEMENT OF LUMBER RIVER, NORTH CAROLINA AND SOUTH CAROLINA.

REFERENCE TO PAST REPORTS.

For preliminary examination, see p. 1102, Annual Report for 1887. For map of river, see p. 1198, Annual Report for 1890.

ORIGINAL CONDITION.

The river was obstructed by logs, snags, stumps, overhanging trees, and in places by sand bars. Long reaches were in fair condition. That portion of the river between Lumberton and the North Carolina line was crossed by five low bridges without draw spans, and one moderately high railroad bridge near Lumberton. In South Carolina the river was crossed by two bridges without draws.

PLAN OF IMPROVEMENT.

The project provides for improving the river for steamboats from its mouth to Lumberton, a distance of 70.8 miles, by snagging and clearing the banks, at an estimated cost of $35,000.

WORK PRIOR TO JUNE 30, 1892.

The parties operating the Fair Bluff and Ivy Bluff bridges had provided satisfactory draw spans. The bridges at Griffins and Mathews had been discontinued. The bridge at Phillips will be provided with a draw as soon as the county commissioners operating it can raise the necessary funds. The Atlantic Coast Line had partly completed a new steel drawbridge to replace the old composite fixed bridge. The new bridge will have a clear opening of over 70 feet.

The river was quite thoroughly cleared by plant owned and operated by the United States for a width of 40 feet and depth of 3 feet at low water between points no miles and 71 miles above the mouth, 12,811 obstructions having been removed. Dividing the total expenditures to June 30, 1892, for all purposes by the above number of obstructions removed, shows the average cost to have been $0.74 for each obstruction removed. A hand snag boat was built.

WORK OF PAST YEAR.

The river was quite thoroughly cleared by plant owned and operated by the United States for a width of 40 feet and depth of 3 feet at low water between points 48 miles and 71 miles above the mouth. The average cost of removing obstructions was 33 cents each. For details of work done, reference is made to the appended report of my assistant engineer, Mr. Reid Whitford, who has shown marked ability in directing and controlling the working parties and maintaining the efficiency of the plant.

REMARKS.

Two small steamers have run irregularly on this river during the year. During the year freights passing over this stream have aggregated 7,154 tons.

With the balance of $1,932.04 on hand July 1, 1893, snagging will be continued, removing the worst obstructions first.

This river is tributary to the collection district of Georgetown, S. C. Georgetown is the port of entry. Amount of duties collected in the calendar year of 1892, $14.82.

For this improvement the following appropriations have been made:

By act of Congress.—	
Of August 11, 1888	$5,000
Approved September 19, 1890	5,000
Approved July 13, 1892	5,000
Total	15,000

Total expenditures, including June 30, 1893, $13,067.96.

For table of commercial statistics furnished by the collector of Georgetown, S. C., see this year's annual report for Waccamaw River.

Money statement.

July 1, 1892, balance unexpended	$496.62
Amount appropriated by act approved July 13, 1892	5,000.00
	5,496.62
June 30, 1893, amount expended during fiscal year	3,561,58
July 1, 1893, balance unexpended	1,932.04
July 1, 1893, outstanding liabilities	239.25
July 1, 1893, balance available	1,692.79
Amount (estimated) required for completion of existing project	20,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	20,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

REPORT OF MR. REID WHITFORD, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Georgetown, S. C., June 30, 1893.

CAPTAIN: I have the honor to report as follows on Lumber River, North and South Carolina, for fiscal year ending June 30, 1893:

Operations were resumed October 3, 1893, by United States hand hoister and hired labor, 48 miles above the mouth and continued to 71 miles at Lumberton, N. C. The following obstructions were removed, quite thoroughly clearing the channel to an approximate width of 40 feet and depth of 3 feet at low water: From the channel—logs, 1,025; stumps, 527; large snags, 732; small snags, 103 cords. From the banks—trees cut, 5,977; brush cut, 178 cords. Of the total amount expended, three-tenths were used on channel and seven-tenths on banks. Each obstruction cost approximately 33 cents. The river has been very decidedly improved.

RECOMMENDATIONS.

It is respectfully recommended that work be continued as heretofore, and that, in addition, the river be dredged where needed to provide a good navigable channel for the steamers which will soon be run on this stream.

COMMERCE.

Such statement as could be obtained is given below, being collected by J. W. Harllee, overseer, who made special trips up and down the river under orders from this office, soliciting information on the subject from the most prominent business men, among whom may be mentioned Messrs. Barnes, Powell, Butters, and Smith.

	1891.			1892.		
	No.	Tons.	Value.	No.	Tons.	Value.
Timber .... sticks	3.000	4,500	$12,600	5,000	6,000	$18,000
Fertilizers	....	100	2,000	....	200	4,000
General merchandise	....	500	25,000	....	600	30,000
Total	....	5,100	39,600	....	6,800	52,000

	1893.		
	No.	Tons.	Value.
Outgoing freights.			
Cotton .... bales	500	1,250	$17,500
Eggs .... crates	200	3	400
Fowls .... dozen	50	1	150
Timber .... logs	5,500	5,500	16,500
		6,754	34,550
Incoming freights.			
General merchandise	....	400	20,000
Total	....	7,154	54,550

This shows an increase of 354 tons over last year. Freights have been transported by two small steamers belonging to Butters Lumber Company, pole boats, and rafts. The following letter from Mr. Butters explains itself. The Butters Lumber Company own and operate a very large milling plant at Hub, Columbus County, N. C., on the banks of the Lumber. They do a very large and increasing business in manufactured lumber of all kinds. The capacity of their mill is about 100,000 feet B. M. per day, besides shingles:

BUTTERS LUMBER COMPANY,
Hub, Columbus County, N. C., May 25, 1893.

DEAR SIR: Your favor of the 17th instant received. Please pardon our delay in not replying to same before, as this writer was absent when your letter arrived.

We floated in round numbers about 2,250,000 feet of pine and cypress logs over the Lumber River between May 1, 1892, and May 1, 1893. This year we probably will not bring in more timber than we did last year over the Lumber River, as you know we are logging principally in our big swamp. We think that the work your men have been doing on the river for some time past has been very beneficial, and we trust that ere long we will have an established steamship line between here or Lumberton and Georgetown. We will ship this year in the neighborhood of 15,000,000 feet of lumber, and with the improvements made on Lumber River, which we now understand are in view, there is no reason why a large portion of this product should not be shipped from here by water to northern points.

We have two little steamers, one of which has made the round trip from Georgetown to Lumberton. We have also towed our large scows heavily loaded with machinery from Fair Bluff and other points to this place, consequently we can not help but think that at some time there will be a regular steamship line on this river.

Should we be able to give you further information in regard to this matter we should be very much pleased to do so.

Yours respectfully,

WM. H. BUTTERS,
Secretary and Treasurer.

Mr. REID WHITFORD,
U. S. Assistant Engineer.

EMPLOYÉS.

Mr. B. T. Daggett, overseer, and Mr. A. H. Woodward, timekeeper, deserve credit for their economical and thorough work

Very respectfully, your obedient servant,

REID WHITFORD,
Assistant Engineer.

Capt. FREDERIC V. ABBOT,
Corps of Engineers, U. S. A.

M 3.

IMPROVEMENT OF LITTLE PEDEE RIVER, SOUTH CAROLINA.

REFERENCE TO PAST REPORTS.

For preliminary examination see page 1111, Annual Report for 1887. For map of river see page 1214, Annual Report for 1890.

ORIGINAL CONDITION.

The river was much obstructed by snags and overhanging trees, and in places was divided into several branches, in neither of which there was a good channel, and by ten bridges without draws.

PLAN OF IMPROVEMENT.

It is proposed to snag the river and close unnecessary branches, providing for steamboat navigation up to the mouth of Lumber River and pole-boat navigation thence to Little Rock, at an estimated cost of $50,000.

WORK PRIOR TO JUNE 30, 1892.

The bridges on that part of the river on which steamboat navigation is to be provided had been supplied with draw openings. The river had been snagged between points no miles and 113 miles above the mouth, 11,689 obstructions having been removed. Dividing the total expenditures to June 30, 1892, for all purposes by the number of obstructions removed shows the average cost to have been 83 cents for each obstruction removed. A hand snag boat had been built and is now on hand in good order.

WORK OF PAST YEAR.

The river was quite thoroughly cleared by plant owned and operated by the United States, for a width of 40 feet and depth of 3 feet at low water between points no miles and 65 miles above the mouth. The average cost of removing obstructions was 50 cents each. For details of work done and commercial statistics reference is made to the report of my assistant engineer, Mr. Reid Whitford, who has showed marked ability in directing and controlling the working party and maintaining the efficiency of the plant.

REMARKS.

One new transportation line has been established on this river during the year, and a steamer has run somewhat irregularly part of the time.

With the balance of $2,416.14 on hand July 1, 1893, snagging will be continued, the worst obstructions being removed first. During the year the freight passing over this stream has aggregated 6,153 tons.

This river is tributary to the collection district of Georgetown, S. C. Georgetown is its port of entry. Amount of duties collected in the calendar year of 1892, $14.82.

For this improvement the following appropriations have been made.

By act of Congress—	
Of August 11, 1888	$5,000.00
Approved September 19, 1890	5,000.00
Approved July 13, 1892	5,000.00
Total	15,000.00

Total expenditures, including June 30, 1893, $12,583.86.

For table of commercial statistics furnished by the collector of Georgetown, S. C., see this year's annual report for Waccamaw River.

Money statement.

July 1, 1892, balance unexpended	$307.12
Amount appropriated by act approved July 13, 1892	5,000.00
	5,307.12
June 30, 1893, amount expended during fiscal year	2,890.98
July 1, 1893, balance unexpended	2,416.14
July 1, 1893, outstanding liabilities	151.77
July 1, 1893, balance available	2,264.39
Amount (estimated) required for completion of existing project	35,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	20,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

REPORT OF MR. REID WHITFORD, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Georgetown, S. C., June 30, 1893.

SIR: I have the honor to report as follows on Little Pedee River, South Carolina, for fiscal year ending June 30, 1893:

Operations were resumed by United States hand hoister and hired labor October 3, 1892, at mile 65 above mouth and continued until March 25, 1893, when work ceased at the mouth preparatory to constructing a steam plant for future use.

The following obstructions were removed quite thoroughly, clearing the channel to an approximate width of 40 feet and depth of 3 feet at low water:

From the channel: Logs, 644; stumps, 477; large snags, 544; small snags, 22 cords. From the banks: Trees cut, 1,737; brush cut, 47 cords. Of the amount expended, five-tenths were used on the channel and five-tenths on the banks. Each obstruction cost, approximately, $0.50 (fifty cents).

The river has been greatly improved.

RECOMMENDATIONS.

It is respectfully recommended that snagging be continued, but after a detailed survey future work be done first in preference at the narrows near the mouth, and that such other places be dredged as may be needed to provide a good navigable channel for the steamers which are running on this stream.

COMMERCE.

The following statement was made up from information given Mr. J. W. Harllee, overseer, who, acting under orders from this office, visited the business men near the river named below: J. W. Holliday, Ellerbee & Ellerbee, and B. F. Davis. The timber statement was kept by Mr. J. W. Harllee during the progress of the work as the rafts drifted by, together with the statement furnished by William L. Buck & Co.:

	1891.			1892.		
	No.	Tons.	Value.	No.	Tons.	Value.
Outward freights.						
Rosin ....barrels..	3,920	686	$5,880	5,000	1,000	$10,000
Spirits turpentine ....do....	408	77	8,160	626	127	9,540
Cotton ....bales..	310	78	15,500	600	150	21,000
Ton timber ....sticks..	2,200	3,300	9,240	4,240	5,088	15,264
Shingles	30,000	15	240	20,000	10	160
Total	....	4,156	39,020	....	6,375	55,964
Inward freights.						
General merchandise	....	458	13,740	....	740	37,000
Grand total	....	4,614	52,760	....	7,115	92,964

	1893.		
	No	Tons.	Value.
Outward freights.			
Rosin ....barrels..	4,400	880	$8,800
Spirits turpentine ....do....	750	150	11,250
Cotton ....bales..	700	175	24,500
Timber ....sticks..	4,050	4,050	12,150
Shingles	20,000	10	160
Eggs ....crates..	275	4	550
Pease ....bushels..	300	9	375
Total	....	5,278	57,785
Inward freights.			
General merchandise	....	875	43,750
Grand total	....	6,153	101,535

This shows a decrease in tons, but an increase in value over last year.

The commerce has been carried on by irregular trips of three steamers (of 30, 60, and 80 tons respectively), tow boats, and rafts.

One new line of steamers was established, but because of some noncompliance with the law in regard to the boiler the boat was not allowed to continue transporting freights on this river.

EMPLOYÉS.

Mr. J. W. Harllee, overseer, and Mr. J. P. Rumley, timekeeper, have been very faithful in the discharge of their duties.

Very respectfully, your obedient servant,

REID WHITFORD,
Assistant Engineer.

Capt. FREDERIC V. ABBOT,
Corps of Engineers, U. S. A.

M 4.

IMPROVEMENT OF GREAT PEDEE RIVER, SOUTH CAROLINA.

REFERENCE TO PAST REPORTS.

For preliminary examination, see page 753, Annual Report for 18 For special description, see page 845, Annual Report for 1880, and pa 723, Annual Report for 1879. For map of river, see page 1180, Annu Report for 1889.

ORIGINAL CONDITION.

The river was dangerously obstructed by snags and logs everywhe Boats drawing 9 feet of water were able to reach Smith Mills, 52 mi above the mouth. Those drawing 3½ feet at low water could get miles farther up, to Little Bluff, or at high water to Cheraw, 172 mi from the mouth.

PLAN OF IMPROVEMENT.

The project provides for a thoroughly cleared 9-foot navigation Smith Mills, and a 3½-foot navigation to Cheraw at all stages of wat at an estimated cost of $117,000.

WORK PRIOR TO JUNE 30, 1892.

The river had been snagged between points no miles and 172 mi above the mouth, since June 30, 1884, 19,385 obstructions having b removed. Before June 30, 1884, the records are not detailed eno to give exact figures. Dividing the total expenditures from June 1884, to June 30, 1892, by the above number of obstructions remov shows the average cost during that period to have been $2.92 for e obstruction removed. A good steam snag boat has been built and now on hand in fairly good order. It will need a new hull before lo but all the machinery is in first-class order.

WORK OF PAST YEAR.

The river was quite thoroughly cleared by plant owned and opera by the United States for a width of 80 feet and depth of 4 feet low water between points no miles and 172 miles above the mo The average cost of removing obstructions was $1.38 each.

For details of work done and commercial statistics, reference is m to the report of my assistant engineer, Mr. Reid Whitford, who h shown marked ability in directing and controlling the working pa and maintaining the efficiency of the plant. Parties operating So Hill Bridge have put in proper fenders and have strengthened the d pier.

REMARKS.

No new transportation line has been established on this river du the year. With the balance of $6,178.28 on hand July 1, 1893, sn- ging will be continued, the worst obstructions being removed fi During the year the freight passing over this stream has aggrega 94,661 tons.

This river is tributary to the collection district of Georgetown, S.C. Georget is its port of entry. Amount of duties collected in the calendar year of 1892, $1

For this improvement the following appropriations have been made:

By act of Congress—	
Approved June 14, 1880	$7,000
Approved March 3, 1881	6,000
Passed August 2, 1882	6,000
Approved July 5, 1884	8,000
Approved August 5, 1886	20,000
Of August 11, 1888	20,000
Approved September 19, 1890	12,500
Approved July 13, 1892	10,000
Total	89,500

Total expenditures, including June 30, 1893, $83,321.72.

For table of commercial statistics furnished by the collector of Georgetown, S. C., see this year's annual report for Waccamaw River.

Money statement.

July 1, 1892, balance unexpended	$3,857.39
Amount appropriated by act approved July 13, 1892	10,000.00
	13,857.39
June 30, 1893, amount expended during fiscal year	7,679.11
July 1, 1893, balance unexpended	6,178.28
July 1, 1893, outstanding liabilities	669.10
July 1, 1893, balance available	5,509.18
Amount (estimated) required for completion of existing project	27,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	27,500.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

REPORT OF MR. REID WHITFORD, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Georgetown, S. C., June 30, 1893.

CAPTAIN: I have the honor to report as follows on Great Pedee River, South Carolina, for fiscal year ending June 30, 1893:

Snagging and clearing banks continued by United States steam hoister and hired labor. From the channel there were removed logs 1,245, stumps 186, large snags 311, small snags 10 cords. From the banks, trees cut 1,579, brush cut 25 cords. Work extended over the entire river from no miles to 172 miles, quite thoroughly clearing the channel. Of the total amount expended, six-tenths were used on the channel and four-tenths on the banks. Each obstruction cost, approximately, $1.38. Operations were greatly delayed by high freshets during the year.

REMARKS.

The improvement of the river has been decidedly marked, as captains of the river steamers and others state.

RECOMMENDATIONS.

It is respectfully recommended that the same character of work be carried on, with additional dredging of shoals where needed, till a thoroughly cleared channel is completed sufficiently deep to permit uninterrupted navigation throughout the whole year from mouth of river to town of Cheraw.

COMMERCE.

The following statement was obtained mainly by Mr. J. C. Tamplet, timekeep from Maj. B. A. Munnerlyn, agent South Carolina Steamboat Company, Willian Buck & Co., lumber and timber dealers, and D. R. Smith, lumber and timber deal

	1891.			1892.		
	Number.	Tons.	Value.	Number.	Tons.	Val
Outward freights.						
Cotton....bales..	5,926	1,483	$296,300	5,780	1,445	$2
Clean rice....barrels..	16,342	2,656	265,558	16,560	2,898	28
Rough rice....bushels..	83,000	1,827	103,750	83,000	1,524	10
Rosin....barrels..	35,800	6,265	50,120	30,000	6,000	[illegible]
Spirits turpentine....do....	4,014	652	80,280	5,436	1,087	8
Cypress shingles....	6,705,987	3,353	53,640	6,970,000	3,485	5
Lumber, cypress....feet..	3,000,000	6,250	45,000	3,100,000	5,166	4
Cypress logs....do...	22,547	33,821	81,169	....	....	....
Wood....cords....	225	225	563	2,000	2,000	[illegible]
Hides, wool, staves, etc....	....	250	7,500	352	352	[illegible]
Timber....sticks..	....	....	....	51,640	61,968	2
Cross ties....	....	....	....	18,000	144	[illegible]
Total....	....	56,782	983,880	....	86,069	1,08
Inward freights.						
General merchandise....	....	5,562	383,450	....	6,402	3
Grand total....	....	62,344	1,367,330	....	92,471	1,40

	1893.		
	Number.	Tons.	Val
Outward freights.			
Rosin....barrels..	21,345	4,269	$4
Spirits turpentine....do...	3,391	678	[illegible]
Cotton....bales..	3,610	903	1
Ton timber....sticks..	58,949	58,949	17
Shingles....	9,163,000	4,581	2
Eggs....crates..	275	4	[illegible]
Peas....bushels..	300	9	[illegible]
Rice, rough....do....	206,343	4,746	2
Lumber....feet, B. M..	4,000,000	6,667	[illegible]
Wood....cords..	2,800	2,800	[illegible]
Tar....barrels..	850	170	[illegible]
Cross ties....No..	33,000	2,640	1
Miscellaneous articles.. Hides, wool, staves, etc....	....	400	[illegible]
Total....	....	66,816	7
Inward freights.			
General merchandise....	....	7,845	3
Grand total....	....	94,661	1,

This shows an increase of 2,190 tons over that given in 1892, but decrease in value owing to low prices pertaining to some of the products of the country. There are other freights carried by pole boats and smaller craft of which no account whatever could be obtained. Commerce has been carried on by seagoing schooners of 250 to 300 tons, tugboats and steamer *Maggie*, to Port Harrelson and Smiths Mills and steamers *Merchant*, *John M. Cole*, and *Santee* to Cheraw, head of navigation.

EMPLOYÉS.

Mr. Homer Jacobs, overseer, Messrs B. H. Oliver and W. P. Jollie, engine drivers, and J. C. Tamplet, timekeeper, have been faithful and efficient in the discharge of their duties.

Very respectfully, your obedient servant,

REID WHITFORD,
Assistant Engineer.

Capt. FREDERIC V. ABBOT,
Corps of Engineers, U. S. A.

M 5.

IMPROVEMENT OF CLARK RIVER, SOUTH CAROLINA.

REFERENCE TO PAST REPORTS.

For preliminary examination, see page 1109 Annual Report for 1887. For map of river, see page 1204 Annual Report for 1890.

ORIGINAL CONDITION.

This creek is really the southern mouth of Lynch River. Its upper end was entirely choked by a tangled mass of driftwood and fallen trees. The lower part was fairly clear of obstructions.

PLAN OF IMPROVEMENT.

The project provides for closing the northern mouth of Lynch River and thoroughly snagging Clark Creek, at an estimated cost of $7,500.

WORK PRIOR TO JUNE 30, 1892.

The creek was roughly cleared by plant owned and operated by the United States, for a width of 40 feet and depth of 3 feet at low water, between points no miles and 7 miles above the mouth, 6,640 obstructions having been removed. Dividing the total expenditures to June 30, 1892, for all purposes, by the above number of obstructions removed, shows the average cost to have been 90 cents for each obstruction.

WORK OF THE PAST YEAR.

The creek was roughly cleared by plant owned and operated by the United States for a width of 40 feet and depth of 3 feet at low water, between points no miles and 7 miles above the mouth. The last appropriation completed the estimated cost. All that is needed has been done, unless Lynch River is improved for steamers as recommended in my report of December 2, 1892, Ex. Doc. 125, House of Representatives, Fifty-second Congress, second session.

The average cost of removing obstructions was 16 cents each. For details of work done and commercial statistics reference is made to the report of my assistant engineer, Mr. Reid Whitford, who has showed marked ability in directing and controlling the working party, and maintaining the efficiency of the plant.

REMARKS.

One new transportation line has been established on this river during the year.

With the balance of $413.81 on hand July 1, 1893, snagging will be continued, the worst obstructions being removed first.

During the year the freight passing over this stream has aggregated 7,628 tons.

This creek is tributary to the collection district of Georgetown, S. C. Georgetown is its port of entry. Amount of duties collected in the calendar year of 1892, $14 82.

For this improvement the following appropriations have been ma

By act of Congress—	
Of August 11, 1888	$2,
Approved September 19, 1890	2,
Approved July 13, 1892	2,
Total	7,

Total expenditures, including June 30, 1893, $7,086.19.

For table of commercial statistics furnished by the collector of Geo town, S. C., see this year's annual report for Waccamaw River.

Money statement.

Amount appropriated by act approved July 13, 1892	$2, 50
June 30, 1893, amount expended during fiscal year	2, 08
July 1, 1893, balance unexpended	41
July 1, 1893, outstanding liabilities	5
July 1, 1893, balance available	35

REPORT OF MR. REID WHITFORD, ASSISTANT ENGINEER,

UNITED STATES ENGINEER OFFICE,
Georgetown, S. C., June 30, 18

SIR: I have the honor to report as follows on Clark River, South Carolina fiscal year ending June 30, 1893.

Work began October 27, 1892, by United States hand hoister and hired labor stopped January 20, 1893.

The entire length of the river was quite thoroughly cleared of obstruction about 40 feet width so that pole flats and timber rafts might use it during ordi low water.

There were removed from the channel, logs 3,714, stumps 183, large snags 2 small snags 294 cords; from the banks, trees cut 1,118, brush cut 270 cords.

Each obstruction cost approximately $0.16.

Of the amount expended eight-tenths were used on the channel and two-te on the banks.

REMARKS.

Many snags were found to have made their appearance in the river since the sation of work last year. Some heavy trees were cut and thrown across the l end of Lynch River from opposite sides with their tops overlapping, thus for a dam which will probably prevent drift from entering Clark River from the Pedee via Lynch River.

The former river is the best outlet for Lynch into Great Pedee, and whe Clark and Lynch are once fairly opened for navigation they will become com cially important. In this way the productive country along these streams wi furnished with transportation facilities which is badly needed so as to save the ple the hauling of their products and supplies expensively long distances to mar

RECOMMENDATIONS.

It is recommended that a good navigable channel be provided and maintain as to permit steamers to run uninterruptedly.

COMMERCE.

The following statement was collected by R. G. Dusenbury, overseer, who, a under orders from this office, visited the business men in person, among whom be mentioned J. G. Eaddy & Co. and William L. Buck & Co.

	1892.			1893.		
	No.	Tons.	Value.	No.	Tons.	Value.
Outward freights.						
Resin .... barrels..	5,000	1,000	$10,000	4,000	800	$8,000
Spirits turpentine .... do....	....	....	....	500	100	7,500
Cotton .... bales..	....	....	....	310	78	10,850
Timber .... sticks..	4,447	5,336	16,009	6,500	6,500	19,500
	....	6,336	26,009	....	7,478	45,850
Inward freights.						
Fertilizers	....	250	2,000	....	....	....
General merchandise	....	....	....	....	150	7,500
Total	....	6,586	28,009	....	7,628	53,350

This shows an increase of 1,042 tons over last year. It was carried on by pole boats and rafts, and one steamer of about 60 tons making occasional trips up into the river.

The following letters from J. G. Eaddy & Co. and Mr. H. E. Eaddy, prominent men and citizens of Clark River country, explain themselves. Also extracts from letter of D. R. Smith, a large mill operator on Great Pedee River near Clark River:

JOHNSONVILLE, S. C., *May 30, 1893.*

SIR: The appropriations made to Clark River by Congress have been of great benefit to the country, having been so valuable to navigation as to enable steamboats to come where it had never been thought they would ply, and we want to call your attention to the fact that Clark River intersects with Lynch River, which, if proper appropriations are granted to Lynch River by Congress, it will, without any doubt, open up great transportation facilities convenient to the people along its banks.

J. G. EADDY & CO.,
Dealers and Commercial Agents.

MR. REID WHITFORD,
U. S. Assistant Engineer.

JOHNSONVILLE, S. C., *May 31, 1893.*

DEAR SIR: I would beg permission to extend to you the appreciation of our citizens in regard to your work done on Clark River. Timber has been going through whenever the water allows it to get down Lynch River. But the many obstructions in this river render the stream almost useless, except when there is a swell in it. We are very anxious to have these obstructions also removed, and beg that you * * * come up and work out Lynch River, so that naval stores, timber, etc., can get to market without waiting six or eight months for water sufficient to carry them. I have known them to lie twelve months waiting for high water. * * * Please accept our congratulations on the success of your work on Clark River, * * * but hope for an appropriation for Lynch River, * * * and then come and complete the system.

With much respect, I remain, your obedient servant,

H. E. EADDY.

MR. REID WHITFORD,
U. S. Assistant Engineer.

SMITH'S MILLS, S. C., *May 31, 1893.*

DEAR SIR:

* * * * * * *

During part of the year our mill was lying idle on account of the impossibility of moving timber down Lynch River. Could you extend the good work you have done on Clark River some 5 miles up Lynch River, it would give an outlet for timber and shipping on that river with 3 feet less water than at present. Hoping that your department will receive a liberal appropriation, and be enabled to continue the good work, which has already benefited this community materially,

Yours, very truly,

D. R. SMITH.

REID WHITFORD, Esq.

EMPLOYÉS.

I wish here to express my thanks to Mr. William Alden James, clerk, who deserv special mention for his untiring efforts in assisting me to carry out your orders re tive to this and all other river and harbor works connected with this office. Mr. I G. Dusenbury, overseer, as usual performed excellent service in removing the obstru tions from Clark River.

Very respectfully, your obedient servant,

REID WHITFORD,
Assistant Enginee

Capt. FREDERIC V. ABBOT,
Corps of Engineers, U. S. A.

M 6.

IMPROVEMENT OF MINGO CREEK, SOUTH CAROLINA.

REFERENCE TO PAST REPORTS.

For preliminary examination see page 1106, Annual Report for 18 For map of river see page 1202, Annual Report for 1890.

ORIGINAL CONDITION.

The creek was much obstructed by snags and overhanging trees, a was crossed by one bridge without a draw.

PLAN OF IMPROVEMENT.

The project provides for improving the creek for steamboats from mouth to Williams Landing, and for pole boats at high water up the head of navigation, by snagging and clearing the banks, at an es mated cost of $17,000.

WORK PRIOR TO JUNE 30, 1892.

The creek was snagged between points no miles and 15 miles ab the mouth, 11,418 obstructions having been removed. The par operating the Mingo Bridge had put in a draw span. Dividing total expenditures to June 30, 1892, for all purposes by the ab number of obstructions removed shows the average cost to have b 83 cents for each obstruction. A good hand snag boat has been bu and is now on hand in good order.

WORK OF PAST YEAR.

The creek was quite thoroughly cleared by plant owned and opera by the United States for a width of 40 feet and depth of 4 feet at l water, between points no miles and 15 miles above the mouth. T average cost of removing obstructions was 86 cents each. For det of work done and commercial statistics reference is made to the rep of my assistant engineer, Mr. Reid Whitford, who has shown mark ability in directing and controlling the working party, and maintain the efficiency of the plant.

REMARKS.

No new transportation line has been established on this creek during the year.

With the balance of $1,453.98 on hand July 1, 1893, snagging will be continued, the worst obstructions being removed first. During the year the freight passing over this stream has aggregated 94,665 tons.

This creek is tributary to the collection district of Georgetown, S. C. Georgetown is its port of entry. Amount of duties collected in the calendar year of 1892, $14.82.

For this improvement the following appropriations have been made:

By act of—	
Congress of August 11, 1888	$5,000.00
Congress approved September 19, 1890	5,000.00
Congress approved July 13, 1892	3,000.00
Total	13,000.00

Total expenditures, including June 30, 1893, $11,546.02.

For table of commercial statistics furnished by the collector of Georgetown, S. C., see this year's annual report for Waccamaw River.

Money statement.

July 1, 1892, balance unexpended	$515.13
Amount appropriated by act approved July 13, 1892	3,000.00
	3,515.13
June 30, 1893, amount expended during fiscal year	2,061.15
July 1, 1893, balance unexpended	1,453.98
July 1, 1893, outstanding liabilities	76.20
July 1, 1893, balance available	1,377.78
Amount (estimated) required for completion of existing project	4,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	4,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867, and of sundry civil act of March 3, 1893.	

REPORT OF MR. REID WHITFORD, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Georgetown, S. C., June 30, 1893.

SIR: I have the honor to report as follows on Mingo Creek, South Carolina, for fiscal year ending June 30, 1893.

Work began October 17, 1892, by United States hand hoister and hired labor and stopped December 22, 1892, preparatory to resuming work later in the season with steam plant.

There were removed from the channel: logs, 164; stumps, 37; large snags, 124; small snags, 7 cords. From the banks: trees cut, 533; brush cut, 48 cords. The work was carried on between points no miles and 15 miles above the mouth of the creek, quite thoroughly clearing a channel 40 feet wide and 4 feet deep at low water, approximately. Of the total amount expended six-tenths were used on the channel and four-tenths on the banks. Each obstruction cost, approximately, $0.86.

REMARKS.

The creek has been very greatly improved by the foregoing work, so the captains of the steamers state.

RECOMMENDATIONS.

It is respectfully recommended that a thoroughly cleared channel be provided an maintained by snagging and dredging, if needed, so that the steamers may run u interruptedly throughout the lowest stages of water.

COMMERCE.

The following letter and statement from Messrs. F. Rhem & Sons explain the selves. The above-mentioned firm controls a large portion of the commerce on th creek, and it is supposed that they are thoroughly familiar with the amount a value of exports and imports.

RHEMS, S. C., *May 1, 1893.*

SIR: You will find inclosed report of commerce of Mingo River for the year commen ing May 1, 1892, and ending May 1, 1893. You will please observe that there has been som increase in tonnage, which is accounted for in this way: The opening up of the riv above Mingo bridge (only a distance of 4 miles) has materially increased the shin and "ton timber" interest. This river is nicely improved from mouth to near Min Bridge and partly improved from bridge to Williams Landing. Before work w commenced above bridge our firm, F. Rhem & Sons, could only run steamer *T Brothers* to bridge, but have been making two trips a week regularly since last Oct ber to Williams Landing. There are two or three sand bars or logs that obstru the channel in two or three places that cause us a great deal of delay and disappoin ment to our customers, viz: we have to wait at Mingo Bridge, 4 miles below Wil iams Landing, for high water to get over the obstructions. This Williams Landi is peculiarly situated owing to dense swamps on each side of this river above Min Bridge, there being only two landings, Berlin on the south side and Williams on th north, some distance further. The improvement above Mingo Bridge has benefit the farmers and others living northwest of this point materially, viz: they had haul their produce, etc., from 10 to 15 miles to get to railroad, and now they tak their freights to this landing, and claim that transportation is much cheaper al We must congratulate you on the excellent manner that you have had the work pe formed on this river. We are decidedly in favor of another appropriation bein made for this river. You will observe that improvement already made has mat rially benefited commerce on this river. We are a dependent people on water tran portation.

Yours, very respectfully,

F. RHEM & SONS.

MR. REID WHITFORD,
U. S. Assistant Engineer.

	1891.			1892.		
	No.	Tons.	Value.	No.	Tons.	Value
Exports.						
Spirits turpentine .... barrels..	11,000	2,750	$220,000	12,000	3,000	$192,0
Rosin .... do....	66,000	11,550	145,000	70,000	14,000	175,0
Crude turpentine .... do....	5,000	1,000	25,000	5,000	1,000	20,0
Wood .... cords..	6,000	6,000	15,000	10,000	10,000	30,0
Staves	350,000	700	1,400	750,000	1,750	3,5
Hoop poles	50,000	50	5,000	50,000	50	6,0
Cotton .... bales..	4,500	1,125	202,500	7,000	1,750	245,0
Shingles	600,000	300	5,000	200,000	30	1,4
Other produce, including wool	....	400	20,000	....	450	25,0
Lumber, cross-ties, etc.	....	12,000	60,000	....	15,000	75,0
	....	35,875	698,900	....	47,030	772,9
Imports.						
General merchandise	....	7,000	350,000	....	8,250	412,5
Total	....	42,875	1,048,900	....	55,280	1,185,4

	1893.		
	No.	Tons.	Value.
Outward freights.			
Spirits turpentine .... barrels..	12,000	2,400	$216,000
Rosin .... do....	70,000	14,000	185,000
Crude turpentine .... do....	5,000	1,250	15,000
Cypress, oak, and pine staves	75,000	190	4,500
Wood .... cords..	12,000	12,000	36,000
Hoop poles	25,000	25	4,500
Cotton .... bales..	7,500	1,850	300,000
Shingles	700,000	350	5,600
Other produce .... tons..	....	600	35,000
Lumber, timber, etc.	....	45,000	200,000
	....	77,665	1,001,600
Inward freights.			
General merchandise	....	17,000	750,000
	....	94,665	1,751,600

The commerce has been carried on by two steamers of 100 tons and 20 tons, respectively, and number of pole boats, rafts, etc.

As will be seen from Messrs F. Rhem & Sons' statement, the freights have increased by about 39,385 tons over last year.

EMPLOYÉS.

Mr. F. A. Haddock, overseer, was as usual faithful and efficient in the discharge of his duties till he accidentally met his death by a falling tree in the latter part of December, 1892.

Very respectfully, your obedient servant,

REID WHITFORD,
Assistant Engineer.

Capt. FREDERIC V. ABBOT,
Corps of Engineers, U. S. A.

M 7.

IMPROVEMENT OF SANTEE RIVER, SOUTH CAROLINA.

REFERENCE TO PAST REPORTS.

For description of river see page 916, Annual Report for 1880. For new project see page 1184, Annual Report for 1889. For map of river see page 1186, Annual Report for 1889.

ORIGINAL CONDITION.

This river was considerably obstructed at all stages of water by sunken logs and snags. Its bar entrance was narrow, crooked, and shifting, with only about 4 feet of water at low tide. Four steamers and a few small vessels were then running upon portions of the river.

PLAN OF IMPROVEMENT.

The project of 1880 proposed to provide the river with a good outlet through Mosquito Creek to Winyaw Bay by deepening and straightening this creek to 50 feet width and 7 feet depth; to secure 7-foot navigation in the river from its mouth 120 miles to Wright Bluff, and thence

5-foot navigation 23 miles farther to the head in the Congaree and Wateree rivers.

The revised project of 1889 provides for leaving the Mosquito Creek Canal, which has been completed 30 feet wide and 3 feet deep, for a timber route; cutting a new canal between Estherville and Minim Creek large enough for river steamers, and snagging the entire river, at an estimated cost of $350,000.

WORK PRIOR TO JUNE 30, 1892.

A passage 30 feet wide and 3 feet deep at high water through Mosquito Creek to Winyaw Bay had been made.

The river had been snagged between points 41 miles and 42 miles above the mouth, 285 obstructions having been removed.

Dredging on the new cut between Estherville and Minim Creek had begun. The total excavation on both canals amounted to 221,460 cubic yards, measured in situ.

The flood gate in the old Mosquito Creek Canal had been completed. Dividing the total expenditures to June 30, 1892, for all purposes by the above number of cubic yards excavated, shows the average cost to have been 51 cents per cubic yard, measured in place. All the work was done by contract, except 1,169 cubic yards in June 1892, which was dredged by hired labor and a hired dredge, at a cost of about 25 cents per cubic yard, measured in place.

WORK OF PAST YEAR.

A large saving in the ultimate cost of the Estherville-Minim Creek Canal was effected by the purchase for $7,500 of the Daisy Bank Plantation, which provided a much cheaper and more satisfactory route than that covered by the former right of way which had been granted the United States via Hopewell Plantation on condition that the United States would restore the rice-field drainage injured by the excavation of the canal. A large body of valuable pine and cypress timber was secured by the purchase of Daisy Bank. Dredging was continued by hired labor with a dredge hired from Mr. Louis S. Ehrich of Georgetown, till September 30, 1892, at which time after twice advertising for proposals to do the dredging by contract without getting any reasonable bids, authority was asked and obtained to build a Government dredge better fitted for the work. At the close of the year this dredge was nearly finished and is a powerful dredge of the Osgood pattern with main engines 12 inches in diameter and 18-inch stroke. The dredging by hired labor cost 24 cents per cubic yard. The lowest price bid for dredging by contract was 33.9 cents per yard.

To secure a little more latitude in locating the canal between the Georgetown Road and the point at which it will enter the United States reservation of Daisy Bank, a right of way was purchased through this portion of the lands of Mrs. Alice L. Johnstone for $3,000. This right of way allows the United States to locate the canal anywhere through these lands with the right to deposit material on either or both sides of the canal, as actually constructed and excavated, for the space of 200 feet from the outer edges of the excavation as dug. No restoration of drainage of any kind is to be done by the United States.

Mr. Reid Whitford, my assistant engineer, has been of the greatest assistance to me in designing the new dredge, in selecting the best machinery, and in setting it up after it was received. He has shown himself to be a thoroughly skillful mechanical engineer, in addition to his well-known proficiency in general civil engineering. Mr. Wm. H.

Johnstone was employed to survey and mark out the United States reservation of Daisy Bank and did so accurately and rapidly.

For details of work done and commercial statistics reference should be made to the appended report of my assistant engineer, Mr. Reid Whitford.

REMARKS.

No new transportation line has been established on this river during the year.

With the balance of $16,190.37 on hand July 1, 1893, dredging will be continued upon the Estherville-Minim Creek route, and some further snagging may be done on the river proper, if it shall seem to be required by the best interests of navigation, and new dredge paid for.

During the year the freight passing over this stream has aggregated 124,182 tons.

This river is tributary to the collection district of Georgetown, S. C. Georgetown is the port of entry. Amount of duties collected in the calendar year of 1892, $14.82.

For this improvement the following appropriations have been made:

By act of Congress—	
Approved March 3, 1881	$22,000
Passed August 3, 1882	20,000
Approved July 15, 1884	15,000
Approved August 5, 1886	18,750
Of August 11, 1888	24,000
Approved September 19, 1890	30,000
Approved July 13, 1892	30,000
Total	159,750

Total expenditures, including June 30, 1893, $143,559.63.

For table of commercial statistics furnished by the collector of Georgetown, S. C., see this year's annual report for Waccamaw River.

Money statement.

July 1, 1892, balance unexpended	$16,409.49
Amount appropriated by act approved July 13, 1892	30,000.00
	46,409.49
June 30, 1893, amount expended during fiscal year	30,369.12
July 1, 1893, balance unexpended	16,040.37
July 1, 1893, outstanding liabilities	9,234.41
July 1, 1893, balance available	6,805.96
Amount (estimated) required for completion of existing project	290,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	200,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for dredging between Estherville and Minim Creek, South Carolina, received and opened at 12 o'clock, noon, of September 9, 1892, by Frederic V. Abbot, Captain, Corps of Engineers.

No.	Name of bidder.	Price per cubic yard.
		Cents.
1	Thomas Young	35
2	P. Sanford Ross	39½
3	W. F. McCauley	47

All bids rejected. Prices too high.

Abstract of proposals for dredging between Estherville and Minim Creek, South Carolina, received and opened at 12 o'clock, noon, of November 4, 1892, by Frederic V. Abbot, Captain, Corps of Engineers.

No.	Name of bidder.	Price per cubic yard.
		Cents.
1	P. Sanford Ross	33.
2	C. P. E. Burgwyn	35.

All bids rejected. Prices too high.

REPORT OF MR. REID WHITFORD, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Georgetown, S. C., June 30, 1893.

CAPTAIN: I have the honor to report as follows on Santee River, South Carolina, for fiscal year ending June 30, 1893:

Dredging continued at Estherville-Minim Creek Canal by hired machinery and labor. There were removed 26,694 cubic yards of material, when the dredge was purchased by the United States Government from Mr. L. S. Ehrich, and the work of transforming it from an endless chain elevator to a modern improved scoop began. The former style of dredge proved to be after a fair trial thoroughly unfitted for this class of work, and utterly unable to remove the stumps and tenacious clay forming a large part of the material to be excavated. It is expected that the scoop will rapidly and economically do the work required. The new outfit was purchased from the Osgood Dredge Company, Albany, N. Y. The completion of the dredge to date has been prevented by the failure of the Osgood Company to deliver the machinery. There were also restored 388 linear feet of rice land drainage for W. C. Johnstone, thus completing all north of the Georgetown road.

"Daisy Bank" plantation was purchased so as to afford a cheaper line for the canal from Winyah Bay to Santee River, and the right of way through Estherville plantation was secured and paid for, so that now the United States own a fee-simple right of sufficient land for the canal from Winyah Bay to Santee River. "Daisy Bank" was surveyed and corners and lines marked plainly. The canal line was surveyed and located through "Daisy Bank." A sawmill was purchased and preparations begun to saw lumber from the fine body of pine timber on this land, as may be needed by the United States.

REMARKS.

The Mosquito Creek Canal passage has continued to be almost indispensable to the public in trading between Santee River and Georgetown.

RECOMMENDATIONS.

It is respectfully recommended that the Mosquito Creek route be maintained at a cost not to exceed $6,000 per year and that dredging on Estherville-Minim route be continued, and that a good channel of at least 80 feet width and 4 feet depth at dead low water be provided and maintained in the Santee River proper, so as to permit steamers to run uninteruptedly throughout the whole year.

COMMERCE.

The accompanying letter and statement of commerce was furnished by Mr. L. S. Ehrich, president of the Georgetown Board of Trade, one of the most prominent and enterprising citizens of Georgetown, and probably the largest shipper of freights in the community. He has given the statement for this river his personal attention for the past several years, and he is doubtless in a position, being engaged in large crosstie and lumber business on Santee River, to know more about the commerce than any one in this place.

The steamers of from 60 to 300 tons have run with their usual regularity from landings on Santee to Charleston, and to Georgetown via Mosquito Creek Canal. Large quantities of cypress timber have come through Mosquito Creek Canal during the year.

PALMETTO CYPRESS COMPANY,
Georgetown, S. C., June 16, 1893.

DEAR SIR: In pursuance with your request, I beg to hand you herewith a report of the statistics as to Santee River and regret that I have been forced to use the figures of last year in reference to some of the items inasmuch as I have not been able to get those of the present season. The principal item of increase is that of timber and inasmuch as the demand is improving and the number of plants to cut it up increasing, there is no doubt that each will show a proportionate increase, especially when the new Government cut via Minim Creek is completed.

Very respectfully,

LOUIS S. EHRICH.

REID WHITFORD, Esq.,
U. S. Assistant Engineer.

	1891.			1892.		
	No.	Tons.	Value.	No.	Tons.	Value.
Outward.						
Cotton.........bales..	20,000	5,000	$850,000	22,000	5,500	$800,000
Rosin.........barrels..	140,000	24,500	175,000	150,000	30,000	185,000
Spirits.........do....	25,000	4,687	350,000	26,000	5,100	355,000
Timber.........pieces..	12,000	18,000	60,000	21,000	25,200	90,000
Shingles.........	3,000,000	1,500	15,000	3,500,000	1,750	17,500
Lumber.........feet..	2,000,000	8,333	20,000	2,000,000	2 000	20,000
Railroad ties.........	23,000	1,610	6,900	35,000	2,800	10,500
Wool.........pounds..	50,000	25	15,000	50,000	25	12,500
Hides.........do....	15,000	8	1,500	20,000	10	1,600
Seed oats.........bushels..	7,000	310	4,200	8,000	184	4,800
Rice.........do....	100,000	2,200	150,000	140,000	3,220	175,000
Staves.........	500,000	500	2,500	400,000	1,000	2,200
Wood.........cords..	10,000	10,000	12,000	12,000	12,000	15,000
Game and fish.........	....	15	1,500	....	34	1,700
	....	71,588	1,663,600	....	88,823	1,690,800
Inward.						
Fertilizers.........	....	*7,500	225,000	....	4,600	230,000
Groceries, provisions, etc.........	....	*11,667	350,000	....	6,600	330,000
Dry goods.........	....	*4,000	225,000	....	4,500	225,000
Boots, shoes, etc.........	....	*4,000	200,000	....	4,000	200,000
Hardware, implements, machinery.........	....	*1,500	80,000	....	2,000	100,000
Total.........	....	100,255	2,743,600	....	110,523	2,775,800

*Value of these tons is necessarily estimated.

	1893.		
	No.	Tons.	Value.
Outward.			
Cotton.........bales..	22,000	5,500	$700,000
Rosin.........barrels..	161,000	35,000	191,000
Spirits of turpentine.........do....	26,450	5,200	361,000
Timber.........pieces..	23,000	39,400	131,000
Railroad ties.........	46,000	3,500	13,800
Wool.........pounds..	50,000	25	12,500
Hides.........do....	20,000	10	12,000
Seed oats.........bushels..	10.000	302	6,000
Rice, rough.........do....	125,000	30,000	150,000
Staves.........	500,000	500	2,500
Wood.........cords..	10,000	10,000	12,500
Game and fish.........	....	45	2,300
		102,482	1,594,600
Inward.			
General merchandise.........	....	21,700	1,085,000
Total.........	....	124,182	2,679,600

The above shows an increase of 13,659 tons, but a decrease in value.

EMPLOYÉS.—Mr. H. F. Price, inspector and surveyor, was, as usual, efficient and untiring in his excellent work. Mr. J. D. Mayo, master machinist, a first class marine engineer and a thorough manager of machinery, deserves much credit for th economical and satisfactory manner in which he has served the United State Government for the past year. H. D. Norcum, overseer, too, was very faithful an zealous in the discharge of his duties.

Very respectfully, your obedient servant,

REID WHITFORD,
Assistant Engineer.

Capt. FREDERIC V. ABBOT,
Corps of Engineers, U. S. A.

M 8.

IMPROVEMENT OF WATEREE RIVER, SOUTH CAROLINA.

REFERENCE TO PAST REPORTS.

For preliminary examination, see page 914, Annual Report for 188
For map of river, see page 1190, Annual Report for 1889.

ORIGINAL CONDITION.

In 1882 this stream had a low-water depth of from 3 to 4 feet fron its mouth, 67 miles, to Camden. The lower 14 miles was completel blocked at all stages of water by logs, snags, etc., and at moderat stages by the bridges of the South Carolina and the Wilmington Columbia, and Augusta railroads, then without draw spans; thenc to Camden, navigation was possible, but dangerous, except during hig water. Its commerce was practically nothing.

PLAN OF IMPROVEMENT.

The project provides for safe and unobstructed 4-foot navigation fo steamers from Camden to the mouth at an estimated cost of $60,000.

WORK PRIOR TO JUNE 30, 1892.

The river had been snagged between points 67 miles and no mile above the mouth, since 1884, 14,914 obstructions having been removed Previous to June 30, 1884, the records are not sufficiently detailed t give exact figures, but a very considerable amount of work had bee done on the river. The railroad bridges had been provided with draws Dividing the total expenditures for all purposes between June 30, 1884 and June 30, 1892, by the above number of obstructions removed, show the average cost during that period to have been $2.02 for each obstruc tion. A good steam snag boat has been built and is now on hand i first-class condition in every respect.

WORK OF PAST YEAR.

The river was quite thoroughly cleared, by plant owned and oper ated by the United States, for a width of 80 feet and depth of 4 feet a low water between points no miles and 67 miles above the mouth. Th average cost of removing obstructions was $1.35 each. For details o work done and commercial statistics, reference is made to the appended report of my assistant engineer, Mr. Reid Whitford, who has show marked ability in directing and controlling the working parties and maintaining the efficiency of the plant.

REMARKS.

No new transportation lines have been established on the river during the year. The appropriation of September 19, 1890, completed the amount that this improvement was estimated to cost. By the expenditure of this sum the entire portion of the river covered by the project has been put into good condition for steamboat navigation. For its maintenance the snag boat owned by the river should be kept at work continuously. The stream is well worth this expense, which would amount to about $6,500 a year. If appropriations are made every two years, $13,000 could be advantageously spent in that period.

The small sum $2,500 supplied in the river and harbor act of July 13, 1892, has sufficed for the past year, as a balance of $8,860.13 was on hand from previous acts, but to keep this important river open for its increasing commerce the sum asked for is absolutely essential for maintenance.

With the balance of $3,045.66 on hand July 1, 1893, snagging will be continued, the worst obstructions being removed first.

During the year the freight passing over this stream has aggregated 6,242 tons.

This river is tributary to the collection district of Georgetown, S. C. Georgetown is its port of entry. Amount of duties collected in the calendar year of 1892, $14.82.

For this improvement the following appropriations have been made:

By act of Congress:	
Approved March 3, 1881	$ 8,000
Passed August 2, 1882	15,000
Approved July 5, 1884	5,000
Approved August 5, 1886	7,500
Of August 11, 1888	12,000
Approved September 19, 1890	12,500
Approved July 13, 1892	2,500
Total	$62,500

Total expenditures, including June 30, 1893, $59,454.34.

For table of commercial statistics furnished by the collector of Georgetown, S. C., see this year's annual report for Waccamaw River.

Money statement.

July 1, 1892, balance unexpended	$6,822.77
Amount appropriated by act approved July 13, 1892	2,500.00
	9,322.77
June 30, 1893, amount expended during fiscal year	6,277.11
July 1, 1893, balance unexpended	3,045.66
July 1, 1893, outstanding liabilities	302.82
July 1, 1893, balance available	2,742.84
Amount that can be profitably expended in fiscal year ending June 30, 1895 Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	6,500.00

REPORT OF MR. REID WHITFORD, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Georgetown, S. C., June 30, 1893.

CAPTAIN: I have the honor to report as follows on Wateree River, South Carolina. for fiscal year ending June 30, 1893:

The United States steam hoister and hired labor continued work so as to maintain the previously cleared channel over the entire river under improvement from the mouth to town of Camden. There were removed from the channel 1,026 logs, 318 stumps, 1,178 large snags, 82 cords small snags. From the banks, trees cut, 657; brush cut, none. Of the total amount expended eight-tenths were used on the channel and two-tenths on the banks. Each obstruction cost, approximately, $1.3

REMARKS.

The progress of the work was delayed by high water. Many new obstructions were found to have made their appearance in the channel during stoppage of work for the sickly season. It will require at least $6,000 per year to maintain a good permanently navigable channel over this river. The current carries large quantities of drift coming down from above Camden which lodge along the banks, forming new obstructions; the erosion of some of the banks cause also obstructive trees to fall in the way of passing steamers. The stream should be kept free of these, or it would soon become impassable except at high stages of the water.

RECOMMENDATIONS.

It is respectfully recommended that a good navigable channel be provided and maintained, so that steamers may be able to run uninterruptedly throughout the whole year.

COMMERCE.

The following statement was obtained by Mr. E. C. Easterling, timekeeper, in manner as explained by his accompanying letter:

UNITED STATES HOISTER WATEREE, *May 20, 1893.*

SIR: I have the honor to transmit a statement of the outward and inward freights of the Wateree River from 1st of May, 1892, to 1st of May, 1893. They were furnished me by the captain of the freight boat, and Mr. Clarkson, who is the largest shipper on the river, and can be relied upon in the main as correct. The freight boat is taken off the river from May to September, and when running the river during the fall and winter months has no regular schedule, which accounts in a great measure for so small an increase in its commerce.

Very respectfully, your obedient servant,

E. C. EASTERLING,
Timekeeper

MR. REID WHITFORD,
United States Assistant Engineer.

	1891.			1892.		
	No.	Tons.	Value.	No.	Tons.	Value.
Outward freights.						
Cotton............bales..	415	104	$20,750	617	154	$21,60
Cotton-seed oil............barrels..	270	54	3,780	395	91	4,345
Cotton-seed meal............	....	27½	605	135	135	2,70
Cotton-seed hulls............	....	10	25	....	15	45
Cotton seed............bushels..	1,000	15	300	....	200	2,20
Resin............barrels..	1,000	175	1,250	3,500	700	7,0
Rough rice............bushels..	10,000	220	12,500	7,000	161	8,75
	....	....	39,210	....	....	46,64
Inward freights.						
General merchandise............	....	400	12,000	....	788	39,40
Total............	....	1,005½	51,210	....	2,244	86,04

	1893.		
	No.	Tons.	Value.
Outward freights.			
Cotton .... bales..	570	143	$20,950
Rosin .... barrels..	18,000	3,600	36,000
Cotton-seed oil .... do....	470	112	8,190
Rice, rough .... bushels..	10,000	230	10,000
Oak staves .... number..	7,000	17	42
Hay .... tons..	12	12	216
Cotton seed .... do....	483	483	10,626
Listers	30	8	600
Cotton-seed hulls .... tons..	20	20	60
	....	4,625	86,684
Inward freights.			
General merchandise	....	1,617	31,045
Total	....	6,242	117,729

This statement shows an increase over last year of 3,998 tons. The commerce has been carried on by one steamer of about 200 tons, making irregular trips.

EMPLOYÉS.

Capt. Kilbia Morse, overseer, Mr. E. C. Easterling, timekeeper, and Mr. John R. Smith, engine driver, have been, as usual, very faithful and efficient in discharge of their respective duties.

Very respectfully, your obedient servant,
Reid Whitford,
Assistant Engineer.

Capt. Frederic V. Abbot,
Corps of Engineers, U. S. A.

M 9.

IMPROVEMENT OF CONGAREE RIVER, SOUTH CAROLINA.

REFERENCE TO PAST REPORTS.

For preliminary examination, see p. 1140, Annual Report for 1885.
For map of river, see p. 1194, Annual Report for 1889.

ORIGINAL CONDITION.

In 1886 this stream had a low-water depth of 3 to 4 feet from its mouth to the railroad bridge at Columbia; thence 1 foot low-water depth 2 miles farther to its head. Navigation of the lower 47 miles was blocked at all stages of water by the South Carolina Railroad Bridge and by sunken logs, snags, and overhanging trees. The navigation of the remaining 2 miles was prevented by swift currents and numerous rock ledges and bowlders. Its commerce was nothing.

PLAN OF IMPROVEMENT.

The project proposes to secure a thoroughly cleared 4-foot navigation over the lower 47 miles at all stages and a cleared channel 100 feet wide through the shoals above, at an estimated cost of $54,500.

WORK PRIOR TO JUNE 30, 1892.

The river had been snagged between points no miles and 47 miles above the mouth, 5,014 obstructions having been removed. The railroad bridge had been provided with a draw.

Dividing the expenditures to June 30, 1892, for all purposes, by the above number of obstructions removed, shows the average cost to have been $4.03 for each obstruction. A good steam snag boat has been built and is now on hand in fair condition. It will need a new hull before long, but the machinery is in fine order. The average cost of work on this river has been abnormally high, as it was comparatively free from small snags, was so broad that but little bank work was necessary, and what work was done was very heavy and was much scattered, necessitating great loss of time while the boat was moving from one snag to the next. This river is also liable to frequent, sudden floods of short duration, which entirely stop work for three or four days at a time, but not long enough to make it advisable to lay up the boat and discharge the hands.

WORK OF PAST YEAR.

No work was done. A survey was made from Granby to the foot of Gervais street to determine what it was best to do on this portion of the river. The slope is so great that nothing but slack-water navigation will be possible. No provision is made for a lock and dam in the approved project, and under section 8 of river and harbor act approved July 13, 1892, the project can not be enlarged.

REMARKS.

No new transportation lines have been established on the river during the year. With the balance of $3,007.74, July 1, 1893, snagging will be continued, the worst obstructions being removed first.

During the year the freight passing over this stream has aggregated 2,781 tons.

This river is tributary to the collection district of Georgetown, S. C. Georgetown is its port of entry. Amount of duties collected in the calendar year of 1892, $14.82.

For this improvement the following appropriations have been made:

By act of Congress—	
Approved August 5, 1886	$7,500
Of August 11, 1888	7,500
Approved September 19, 1890	5,000
Approved July 13, 1892	5,000
Total	25,000

Total expenditures, including June 30, 1893, $21,992.26.

For table of commercial statistics furnished by the collector of Georgetown, S. C., see this year's report for Waccamaw River.

Money statement.

Amount appropriated by act approved July 13, 1892	$5,000.00
June 30, 1893, amount expended during fiscal year	1,992.26
July 1, 1893, balance unexpended	3,007.74
July 1, 1893, outstanding liabilities	429.34
July 1, 1893, balance available	2,578.40

Amount (estimated) required for completion of existing project.......	$29,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	25,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

REPORT OF MR. REID WHITFORD, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Georgetown, S. C., June 30, 1893.

SIR: I have the honor to report as follows on Congaree River, South Carolina, for fiscal year ending June 30, 1893:

No snagging was done for the reason that the stage of water has not been exactly suitable to permit of this in an economical manner, and as the appropriation was very small, no risks could be taken in attempting the work at flush-water periods, and thus possibly expend some of the money disadvantageously to the improvement. Aside from this, the neighboring river, Wateree, has needed the steam hoister, owned conjointly between these two streams, more urgently than the Congaree. The latter stream will be snagged over later in the season during the low-water period. The river was surveyed from Granby 2 miles upward to Gervais Street Bridge at Columbia, with the view of opening the channel for steamers to that city. The result of the survey and map with recommendations have been already forwarded to you.

GENERAL RECOMMENDATIONS.

It is respectfully recommended that a good navigable channel be provided and maintained to at least 80 feet width and 4 feet depth at dead low water, so as to permit steamers to run uninterruptedly throughout the whole year from mouth of river to Gervais Street Bridge at the city of Columbia.

COMMERCE.

The following statement of commerce was obtained by R. G. Dusenbury, overseer, from best sources of information available:

	1891.			1892.			1893.		
	No.	Tons.	Value.	No.	Tons.	Value.	No.	Tons.	Value.
Outward freights.									
Cotton ....bales..	100	25	$5,000	150	38	$5,250	225	56	$7,875
Spirits turpentine .....barrels..	218	41	4,360	303	30	7,575	250	50	3,750
Rosin ....do....	8,200	1,435	11,480	10,975	2,743	16,450	6,500	1,300	13,000
Hay ....bales..	....	....	....	....	....	....	500	75	1,500
Cotton seed..............tons..	....	....	....	....	275	2,750	500	500	5,000
	....	1,501	20,840	....	3,086	32,025	....	1,981	31,125
Inward freights.									
General merchandise............	....	900	27,000	....	600	30,000	....	800	40,000
Total	....	2,401	47,840	....	3,686	62,025	....	2,781	71,125

The above shows a falling off in tonnage, but an increase in value over last year. The commerce has been carried on by one steamer of 200 tons making very irregular trips, and for long periods not running at all. Certainly such imperfect service does not tend to increase the commerce largely or rapidly.

The accompanying letters, furnished by Dr. W. J. Murray, president Board of Trade of Columbia, and Col. S. A. Pearce, a prominent citizen of that city, who was for a long time president of said Board of Trade, relating to the contemplated improvement of the Congaree River, explain themselves. Col. Pearce has manifested an active interest in this stream since its examination by the United States. The citizens of Columbia generally are especially anxious to have the navigation extended from Granby to Gervais street Bridge, at the city. It is believed that the commerce which will be carried over the river immediately upon the completion of a channel to Gervais Street Bridge would more than repay the United States for the outlay of money to accomplish this, and besides furnish the city with such transportation facilities as would give them much lower freight rates. They are now at the mercy of the railroads entering Columbia.

COLUMBIA BOARD OF TRADE,
Columbia, S. C., June 1, 1893.

DEAR SIR: It affords me great pleasure to give you some of the very important reasons why the Congaree River should be opened up for navigation from Granby to the foot of Gervais street, in the city of Columbia, for steamers now running on the river. This is of vital importance for the commercial interest of our growing city.

Columbia, S. C., has doubled its population within the last decade, having now about 20,000 inhabitants, besides the suburbs aggregating 2,500 of population. From the 1st of May, 1892, to the 1st of May, 1893, I find the trade amounts to about $9,500,000, the freight tonnage to about 900,000 tons per annum.

We have just developed a water power of 13,000 horse power, the largest yet developed in the United States; there is already in operation an electric plant using 800 horse power, which runs our street cars, and our city is lighted by this power; the city waterworks are also operated by this power, having developed a plant of 500 horse power.

We have a very large cotton ducking mill being constructed which will operate 45,000 spindles, consuming 15,000 bales of cotton of 500 pounds each annually. They have developed 1,000 horse power to operate this plant, and we are expecting very soon to commence the erection of two more cotton mills. We have two large fertilizer factories, manufacturing 20,000 tons of fertilizers annually, which have a capacity of much more, and would manufacture 30,000 if we could get a cheaper rate of freight; large quantities of phosphate rock are used by these factories which could be brought here by steamers much cheaper than by rail and would enable these industries to compete with other manufactories, from which they are now prevented by not having water navigation to the city. Columbia has two large cotton-seed-oil mills receiving 60,000 tons of cotton seed annually, and shipping the product of these seed and oil and cotton seed meal, much of which would be shipped by the steamboats did they come up to the city. Also have a 90-inch Moss Cotton Compress, compressing annually for export 50,000 to 60,000 bales of cotton. This cotton could be shipped by steamer on a through bill of lading to the markets of the world. The railroads, eight in number, different lines, are all very near the river at Gervais street in the city. There is a large cotton-batting mill manufacturing cotton bats; a hosiery mill manufactory, shipping the output both East and West. In addition to these we have iron foundries, machine shops, manufacturing all kinds of iron work and steam engines; wood working mills, canning factory, two large and improved brick manufactories, making 35,000 brick each per day; three large granite quarries, two of which are located on the river, and others would doubtless be opened up had we cheap freight rates; several large jobbing houses which are doing business here feel the great want of relief in this matter of cheaper freights, to enable them to compete with other markets, which would increase their trade very materially. From Columbia to the mouth of the Congaree this river flows through one of the most fertile portions of this or any State, not surpassed by the Mississippi River bottom lands, capable of producing thousands of bushels of corn annually, acres of which have been known to produce with ordinary culture 80 bushels of corn per acre. The greater part of these lands are now neglected for the want of river navigation, being too far to haul in wagons and then pay high freights to reach the markets. Steamers coming to Columbia would give them relief, thus causing thousands of acres to be cultivated that now are entirely neglected; there is now on the Congaree five or six hay meadows producing about 1,800 tons annually and need a market, which would give the relief they ask if the steamers could come up to Columbia, enabling them to distribute their hay throughout the State; there are thousands of acres of original forests containing oak, hickory, beech, ash, cypress, etc.; large saw mills and shingle mills would doubtless be put up and operated could they get means of transportation to Columbia by steamers where they would reach the railroads centering at Columbia to distribute their output; large quantities of rosin and turpentine are now being shipped and would very much increase could they reach this city by steamer. I feel safe in saying that had we this river opened up to Columbia the steamers would, by being able to come up to Gervais street, get 250,000 to 300,000 tons of freight per annum to haul. I trust we will get the relief our growing city and commercial interests of the country at large seem to demand.

Yours very truly,

W. J. MURRAY,
President Board of Trade.

MR. REID WHITFORD,
United States Assistant Engineer.

COLUMBIA, S. C., *June 15, 1893.*

DEAR SIR: In October, 1884, as president of the Columbia Board of Trade, I had the honor to address you officially upon the subject of the improvement of the Congaree River up to Gervais street, in this city. Since that time the United States

Government have, under the direction of Army Engineers, cleared this river from obstructions, giving a minimum depth of 4 feet of water as far up as Granby, and steamboats have been running between Charleston and Granby for a number of years; but the long haul from Granby to the city, a distance of 3 miles, over a poor road, has operated against the river business for Columbia to a considerable extent. Our city now numbers about 20,000 inhabitants. It is a railroad centre with eight lines of railroads running into it. It is the geographical centre of the State and is destined to be a great distributive point. The Messrs. Clyde have put on a line of ocean steamers running from New York City to Georgetown, S. C., and boats running on the Congaree, Wateree, Santee, and Pedee rivers can connect with these steamers or take their freights to Charleston. Assurances are given that boats will be run up the Congaree to Gervais street as soon as it is made navigable, and increased interest has been manifested in this important work. A committee of citizens has recently visited Charleston and waited upon Capt. Abbot, United States Engineer Officer in charge of the river and harbor work in this State, to ask that a survey of the river be made above Granby. Some of the gentlemen composing this committee were W. A. Clark, esq., president of the Advance Club and of the Carolina National Bank; Hon. W. C. Fisher, mayor of the city; Dr. W. J. Murray, president of the Columbia Board of Trade. The promptness with which their request was met is appreciated in this community. We wish you and your corps of efficient men much success in the survey you are now making of this portion of the river, and we feel sure that great benefits will be derived from the completion of this work of such national importance. I have not attempted to show the commercial importance of this river improvement, as I understand that a committee of the Board of Trade are preparing some statistics for you. During your visit here you have seen evidences of the growth and prosperity of Columbia. A great water power has been developed and will be further developed; large cotton-seed-oil mills and phosphate works have been established; the granite industry has largely increased, and mills have sprung up since work on our river was commenced. The completion of the work will start new industries in Columbia and along the river, and serve to cheapen transportation to the ports of this and foreign countries.

With best regards, yours very truly,

S. A. PEARCE.

Mr. REID WHITFORD,
Assistant United States Engineer.

EMPLOYÉS.

I am greatly indebted to Mr. W. H. Johnstone, surveyor, for most efficient aid on this river as well as other work under this office.

Very respectfully, your obedient servant,

REID WHITFORD,
Assistant Engineer.

Capt. FREDERIC V. ABBOT,
Corps of Engineers, U. S. A.

M 10.

IMPROVEMENT OF HARBOR AT CHARLESTON, INCLUDING SULLIVAN ISLAND AND MOUNT PLEASANT SHORE, SOUTH CAROLINA.

REFERENCE TO PAST REPORTS.

For history of operations up to June 30, 1888, see p. 970, Annual Report for 1888. For modified project, including estimates, see p. 1150, Annual Report for 1889.

ORIGINAL CONDITION.

There were four channels across the bar, the deepest having about 12 feet at low water.

PLAN OF IMPROVEMENT.

It is proposed to establish and maintain, by means of two jetties, a low-water channel of not less than 21 feet across the bar. The action of the jetties is to be assisted by dredging. The estimated cost of th project is $4,380,500, if the jetties are left at mean low-water leve throughout. If brought up to 3 feet above mean low-water leve throughout, $5,334,500.

WORK PRIOR TO JUNE 30, 1892.

The foundations of both jetties had been completed out to the cres of the bar. Log mattresses loaded with stone were used throughou as foundation and to some extent as hearting. Considerable portion of both jetties had been raised to mean low-water, about 6,000 feet o the North Jetty to high-water and about 5,000 feet of the South Jett to high water.

The following material had been used:

	Dredging.	Stone.		Mattresse
	Cu. yds.	Tons.	Cu. yds.	Sq. yds.
North Jetty	....	82,716	122,335	175, 1
South Jetty	....	163,308	143,414	306, 5
Total	290,970	246,024	265,749	481, 7

A plant for quarrying and depositing stone and a fine pump dredg had been procured for work by hired labor, in addition to that by contract.

CONTINUING CONTRACT.

At the close of the last fiscal year all work was suspended for th lack of funds. The Government dredge was in New York receiving new boiler. On the 13th of July, 1892, the river and harbor bill wa approved by the President. The item for this locality was as follows:

> Improving harbor at Charleston, including Sullivan Island and Mount Pleasa shore, South Carolina; continuing improvement, two hundred and twenty-fi thousand dollars: *Provided*, That contracts may be entered into by the Secretary o War for such materials and work as may be necessary to complete the presen project of improvement, to be paid for as appropriations may from time to time b made by law, not to exceed in the aggregate one million nine hundred and fifty-three thousand dollars, exclusive of the amount herein and heretofore appropriated.

This made it imperative to do all work under the new appropriatio by contract, and preparations were at once made to change the method of administration which had proved so successful last year so as t conform to the new law. The balance of the former appropriation wa expended in dredging with the United States dredge until the ne contract could be let.

Proposals were advertised on August 23, bids were opened on September 23, the contract was signed on October 4, was approved by th Chief of Engineers, and dredging under it began on October 15, 189

In September the dredge was taken out on the ways and was pu in good order throughout. All her iron gate hinges and gate fixture were replaced at this time by others made of brass, to avoid corrosio by the coppering on the hull. The stone lighters had new decks 4 inches thick put on during the summer and the machinery was overhauled both on the floating hoisters and at the quarries. At the latte place the railroad tracks were shifted and new derricks set up read for work. All this was done to make it fair to charge the contractor a remunerative rental for the Government plant.

On the 15th of October the Government plant was turned over to the contractors.

In deciding what rent to charge the following points were kept strictly in view:

(1) The United States plant was of capacity to do only about half the required stonework, but was fully sufficient to do all the dredging.

(2) To charge too high rent would raise contract prices more than the rent deducted from payments would save.

(3) To charge too little would result in having a fine plant worn out for the benefit of the contractors, without any corresponding gain to the United States, as they would be sure to abuse that which the Government valued so lightly.

With these ideas as a basis the following clauses were incorporated in the specifications:

> The United States has now on hand in good order the following plant: One complete quarry and quarry plant near Edgefield, S. C., with a capacity of 10 cars or more of granite per day; one set of derricks on railroad wharf in Charleston, S. C., with steam hoisting engines capable of unloading 25 cars of rock up to 7 tons in weight per day; two complete steam-hoisting scows valued at $5,000 and $7,000 respectively, capable of discharging together 800 tons of rock of above size per day on the jetties; eight 200-ton scows, valued at $1,000 each; one tugboat valued at $15,000; one pump dredge valued with her equipment at $65,000, and capable of dredging and dumping 2,000 yards of material a day.
>
> This plant must be employed by the contractor. He will be charged the following rent, to be deducted from payments due or to become due him: For the quarry plant, $200 a month and a royalty of 2¼ cents per ton for all rock removed from the quarry; for the derricks on railroad wharf, $75 a month; for the two steam-hoisting scows and 8 rock scows, $600 a month; for the tugboat, $500 a month; for the dredge, $2,000 a month.
>
> The above plant, together with the accompanying lines, anchors, tools, implements, spare parts, etc., now on hand will be chartered to the contractor on the express condition that in case of loss he will be required to replace the lost item with a new one equally good in the opinion of the engineer officer in charge.

The lowest bid received was that of Messrs. Egan & Friday. Their prices for stone were, according to the location and character of the work, as follows: $3.20, $2.25, $2.30, and $2.35 per short ton in place in the jetties. The stone at $2.30 per ton corresponds closely with the work done by hired labor during the last fiscal year at $1.70 per ton. Freight rates had risen 10 cents per ton after the United States hired labor work stopped, so that for comparison the United States price would be $1.80. The eight hour law if enforced would increase the contractor's expenses to an extent that was hard to estimate, but for fairness it should not be calculated at less than 20 per cent. On this basis the United States cost would be $2.16. This leaves the contractors a certain profit of 14 cents a ton, or about 7 per cent. The prices bid for other classes of rock were fairly proportioned to the difficulty of work as compared with that at $2.30.

The cost to the United States for this rockwork is diminished by the monthly rental of the United States rock plant, amounting to $1,375, or about 5 cents a ton, at the rate at which work has actually progressed. The price for mattresses was very high, but the work was to be done in a very exposed position, and the item was a comparatively small one. The dredging price was 28 cents. The previous year it cost the United States 11⅛ cents, and the monthly output had been about 20,000 yards. A return of about 10 cents a yard was thus to be looked for from the monthly rent of the dredge, $2,000, making the price really 18 cents a yard, or less than has usually been paid for pump dredging by contract on the Atlantic coast of the United States.

Securing such favorable prices shows that the rents charged were not too high. That they were sufficiently high became apparent at the very start. The money received from rent will pay back to the United States every cent paid for plant by the time the contract is completed at the present rate of progress. In addition to this the contractors saw that to make the Government plant pay them for what it cost them it must be worked continuously, and consequently must be kept in good order. They at once provided duplicate parts for the dredge and other machinery, and have been spurred up to a rate of work they would not otherwise have attained.

While on this subject it is satisfactory to report that several improvements on the United States dredge have been invented and applied by Capt. E. O. Patterson, who represents the United States' interest in the boat. A new form of drag of his invention has nearly doubled her rate of pumping, so that she has succeeded in raising with it 46,[illegible] cubic yards in one month, while with the original drag the maximum was about 23,500 cubic yards in a month. He has also invented a method of keeping sand from leaking through the bins into the hull, and an attachment for greatly prolonging the life of the rubber part of the suction pipe. Attention is invited to his letter, which is appended to the report of my assistant engineer.

In a work of this magnitude it is impossible to foresee all that may be necessary, without providing for a large amount of work that may never be required. To save the United States from being forced to do any unnecessary work, and at the same time to leave the Government free to do anything that may prove essential, the contract was carefully so drawn as to pledge the United States only to an amount of $1,300,[illegible] worth of work under the specifications, which were drawn so as to cover all that could possibly be foreseen as probably necessary, but to leave the United States the power to require the contractors to continue work under the specifications till the full $2,178,000 authorized by law had been earned by them. The contract for stonework and dredging was let in a single contract with a proviso that either stonework or dredging could be pushed or slackened at the will of the United States, as the needs of the work developed in the future. A monthly progress of at least $45,000 was required, and the contractors were authorized to continue work at their own expense while funds were not available, on the promise of payment as soon and as far as new funds were provided. The actual progress has largely exceeded the required rate, averaging $55,000 a month for the whole contract so far.

A provision which has proved of the greatest utility is "that in case of damage other than the usual wear and tear, repairs to United States plant shall be made under the direction of the engineer officer in charge, and the bills paid by the contractors."

To ensure reasonable bids it was considered very desirable to exclude only such parties as had clearly insufficient financial standing, and to open the competition to all who could reasonably be expected to carry out the work if they were awarded the contract. The bond was therefore placed at only $130,000, and a clause was inserted that 10 per cent would be retained from each payment till $65,000 were thus held by the United States, and that thereafter the monthly payments would be made in full. This proved a very successful policy, as the present contractors were neither of them men of very great wealth, and at the same time their joint capital has proved sufficient to insure a very rapid rate of progress and most satisfactory work. To have required a larger bond and to have retained 10 per cent from each and every payment till completion of the contract would have excluded these gentlemen, who had both done good work here under previous contracts in their own names.

The advantage of letting a single contract to complete the work here and of pledging the Government to provide funds for continuous work has already become very apparent. The magnitude of the payments has induced the railroads to provide new facilities in the way of cars and special rock trains, the contractors have been sure of enough work o pretty well wear out their plant, and have in consequence enlarged heir facilities in every way, and the work has progressed at a rate ully three times as great as ever before. The United States is now ertain of completing this work for $1,884,000, which is $294,000 less han the least estimate, even if everything covered by the specifications s done. It is possible that the work may be completed for $1,300,000, which is all that the contractors can force the United States to spend under their contract. A saving of $800,000 is thus possible.

The results of this increased rate of work have also become apparent n the effects produced upon the bar. This year, for the first time, a atisfactory navigable channel between the jetties, affording Charleson better depth than she has ever before enjoyed, can be reported. The new channel has been lighted by the Light-House Department, and through it the bulk of shipping now enters and leaves the port.

WORK OF PAST YEAR.

The stonework of the year has been divided into two classes. The irst has consisted of widening and reinforcing the inner part of the orth jetty where it will be left at or below mean low water permanently. Small stone in a layer about 3 feet thick has been used to orm an apron on both sides of the jetty to receive the overpour. The est of the work has consisted in raising both of the jetties with large tone.

The high portion of the south jetty was extended shorewards as far as the outer edge of the old Main Ship Channel. When this point had een reached a careful set of current measurments was made in Swash Channel at the stations occupied in 1890. The results showed, in brief, hat the force of the ebb currents had been almost doubled both for pring tides and ordinary tides. In 1893 the flood currents were only bout two-thirds as strong as the ebb. The new maximum ebb currents in the Swash Channel were not widely different from those formerly existing at the station in the Main Ship Channel occupied in 890, where there was a depth of over 40 feet at mean low water. Under the circumstances it was deemed wise to suspend work on the outh jetty at this point as it was by no means impossible that the ontraction of waterway had been continued as far as necessary. At ll events it is wise to wait for a time and observe the motion of sand efore any more current is thrown into the new channel.

The shore-end of this jetty has been raised and made substantial to esist the increased strain produced by crowding the high outer portion f the south jetty so near to the Main Ship Channel.

The high part of the north jetty has been reinforced with extra tone, and also extended both seaward and towards the shore. The igh pile on the outer end of the south jetty has also been extended sea-ard, but not so fast as I wished on account of bad weather and the ifficulties of the location.

The dredging has been limited to the same range as last year, St. Philip's church steeple, and the light-house on Fort Sumter. A light has been placed in the steeple, and the range is so sensitive that a variation of 15 feet to either side can be plainly noticed by a pilot, either during the day or night. The dredging has been production of greatly increased depths throughout. For a distance of about one-half mile, near the outer end of this course, the full ultimate depth, 21 feet at low tide, or more, has been secured. The effect produced by dredging is well shown by the profiles on sheet 1, made from actual soundings taken as closely as possible along the range in May, 1889, and June, 1893.

In carrying on the work of the year ample funds have made it possible to do what was needed to produce prompt results, while in former years the uncertainty of funds made it frequently necessary to do work that was not of immediate effect on the currents because it was dangerous to attempt too radical measures which, if left partly executed, might result disastrously. No unnecessary work has at any time been done, but it has often been imperative to apply a small appropriation mainly to the prevention of unfavorable changes instead of pushing on the contraction of waterway on which actual increased depth on the bar depends.

Much credit is due my contractors for the energy with which they have carried out their part of the work and for the uniform courtesy and attention to my wishes which has characterized their relations with this office. Their work has proved decidedly remunerative, especially the dredging, and they have spared no reasonable effort to make their methods and personnel as well as their actual work satisfactory to me. The greater part of the steam hoisting work on the bar has been done with the Government plant, which has proved itself this year, as during the last, to be better adapted to this class of work than that supplied by the contractors. The Government hoisters can work in any ordinary weather, as they are of light draft and can get close to the jetties without striking the submerged rock, while the deep-draft scows which they unload lie alongside them in deep water. The derrick scows supplied by the contractors are those used last year by Mr. Friday. They have each two hoisting engines and two derricks and carry their own loads. They draw so much water that in bad weather they can not get near enough to the rocks to reach the range with their booms. They have been provided with higher masts and longer booms and now unload a scow alongside after they have completed their own unloading. In good weather they put off about 600 tons in the same time that each of the Government hoisters discharges 450 tons, but they can only work about one day in three that the Government hoisters do.

For details of where the work was done and the quantities of rock deposited and sand dredged the report of my assisiant engineer, Mr. James P. Allen, should be consulted. He has most ably and efficiently assisted me in carrying out the work. His advice has been freely given whenever asked and has been uniformly judicious; his work has been unusually arduous, as the increased rate of progress has necessitated almost constant surveying, inspection, and changes of range marks, but the contractors have never been delayed by having to wait for him. He has been well supported by a most satisfactory corps of subordinates.

METHODS OF MEASUREMENTS AND KEEPING ROCK ACCOUNTS

The rock comes almost entirely by rail from Columbia and Edgefield, S. C., and is paid for by the ton of 2,000 pounds, weighed on railroad ales, which method has proved much more satisfactory than paying tirely by the displacement of the scows. At each of these points the nited States has a weigher, who weighs each car before it is shipped y the railroad company and enters on a tag tacked to the car the ate, number of car, name of shipper, and gross weight. The cars are eighed empty by the same gentleman at intervals, and proper tare sts are thus prepared. Quite frequent reweighing has proved to be ecessary, as the car floors rapidly wear under their rough freight and re repaired in many cases by putting in double floors, which increases e tare weight as much as one ton to the car.

Each day the weigher sends to this office a list of cars shipped, with eir gross weights, tares, and net weights. These reports are carelly checked over here. At the railroad wharf the United States has n inspector, who removes the tag from each car and notes on it the ow number on which the contents of the car is placed, and also reorts for deduction the estimated weight of any rock that falls overoard and of the broken rock and dirt left in the cars after unloading. e submits these tags daily to the main office with a notebook, in hich he enters all cars which have been discharged during the day, ith their gross weights as shown by the tags and their assignments the different scows. These notebooks and tags are then compared nd checked in the office with the weigher's daily reports, and the scow which each carload is placed is entered on the original daily report om the weigher. From these lists and the tags a sheet is prepared r each scow showing the numbers of the cars placed on it and their dividual net weights. The total of these net weights determines the ad of the scow for which the contractor is to be paid when it is dis- harged on the jetties.

As a separate and independent check, each scow is gauged just before nd just after it is discharged, and the quantity of rock thus measured reported by the outside inspectors in their ten-day reports, together ith their recommendations as to rock to be deducted for wrong size or ferior quality. During the year this check has come out with sur- rising accuracy. Individual scows differ by several tons in their loads shown by railroad scales and by displacement, but in the aggregate e two methods have agreed within a very few tons to the thousand. will be seen that each step is checked by two different men, so that ithmetical errors are nearly impossible, and the accuracy of the scales d the reliability of the Government weighers are further checked by e gauge weights of the outside inspectors, who have no means except e gauging of knowing anything about the load on any scow they dis- arge.

This duplicate system has proved to be essential to accuracy, and in se of cars wrecked en route or partly unloaded on the way on account minor injuries it affords a complete and satisfactory means of insur- g the United States against loss and of correcting the railroad rec- ds, which at times have become hopelessly mixed when considerable cidents have taken place. As many as eighty cars have been unloaded a day, and to weigh them all in Charleston just before they are un- aded is out of the question on account of the crowded condition of the ilroad yards.

These rock accounts have been kept by Mr. T. G. Prioleau and Mr. . A. Leland, and they deserve my thanks for the almost perfect accu- cy of their work, which at times has been very heavy. They have both rformed other important duties with like efficiency. In making pay- ents the same general method is followed and each clerk's work is checked by some one else, who uses, when possible, a different meth of getting his figures from that employed by the man he checks. Th money accounts and papers have been in charge of Mr. Wm. H. Por as chief clerk, checked and assisted by Mr. T. G. Prioleau and Mr. F. D. Middleton, who has in addition charge of the entire correspond briefing, indexing, and filing of all records and papers. These gen men have been efficient and faithful.

ANNUAL SURVEY.

The main feature of this year's survey is the existence of a strai navigable channel over 15 feet deep at mean low water from the c to deep water outside the bar. Last year a narrow crooked 12-f channel, unfit for navigation, was reported between the jetties. n the site of the present 15-foot channel the best water that could be r ried all the way through was at that time less than 10 feet. The n channel is the joint result of scour and dredging, as the quantity of terial removed is largely in excess of what has been dredged.

In the funnel-shaped area inside of the parallel parts of the jettie aggregate change of cut or fill has occurred. The mean depth in area accidentally shows about one-tenth of a foot less than last ye survey. The most accurate soundings would fail to detect such a sm change if it had really occurred.

During the year scour has been very active between the paral parts of the jetties and for some distance beyond. The eroded m rial has, some of it, found temporary lodgment immediately seawar the jetties, but the fill in this region is much less than the cutting fr which it has been formed, even when account is taken of the mat removed by the dredge. All indications point to its movement t the southwest entirely out of the line of the channel.

The most active scour has occurred in the parts of the jetty chan parallel to the jetties and about 1,000 feet from them; the middle shows less change, but still a marked deepening is evident. A se of holes more than 15 feet deep at low tide and nearly connecting exists about parallel to the north jetty and about 1,000 feet from it.

The shoals which connected with the north jetty at its extreme o end last year have been forced outward and southwestward, so t they are now about midway between the axes of the jetties prolon

Near and beyond the outer end of the south jetty the greatest s has occurred, a large area over 18 feet deep having formed where dredging has been done. There is a tendency indicated for this d water to cut through the narrow outer bar to the southward. To p vent this result, which would give a crooked channel in place of the p ent straight one, orders have been issued the contractors to ex the foundation of the south jetty to its full projected length as a t tress sill.

Along the axis of the dredge cut there is a length of about one-h a mile which now has the full projected depth of 21 feet or mor at mean low water.

Since 1884 over 1,000,000 cubic yards have disappeared from the jetty channel, and of this over 500,000 have gone out during the p year. As the dredge has only removed 300,000 cubic yards in this t as measured in her bins, this result is most encouraging.

MISCELLANEOUS.

The Mount Pleasant shore protection is in a fair condition and has accomplished its purpose. A drawbridge has been partly built acros the cove in rear of Sullivan Island, the plans having been approved by the Secretary of War. Morris Island shore has held well, and in places has made out. Sullivan Island has remained practically unchanged, except at the extreme eastern end, where it has made out. No settlement of the jetties has occurred. The narrow high ridges built along their axes have been leveled down somewhat by the waves, as was anticipated, and the work has assumed a cross-section of much greater stability. This method will be followed in future as the most convenient, economical, and best calculated to obtain prompt results, and as the narrow portions become too low additional stone will be deposited whenever the necessity for it arises.

REMARKS.

With the balance of $631,285.33 on hand July 1st, 1893, work will continue under the contract with Messrs. Egan & Friday. The dredging under this contract will be done entirely with the United States dredge now rented to the contractors, and the stonework will be done by the combined plants owned by these gentlemen and by the United States.

At the rate work is now in progress funds will be exhausted about the 1st of January, 1894. Whether the contractors will then continue work at their own expense until new funds are appropriated, as they are permitted to do under the contract, or whether they will suspend work can not be foretold, as it depends entirely on the contractor's option. By the terms of their contract they are required to resume work as soon as funds become available. It is most desirable that work should not be suspended.

This work is in the collection district of Charleston, S. C., which is the port of entry. Amount of duties collected in calendar year 1892, $15,494.24.

Since the existing project of improvement has been adopted the following appropriations have been made:

y act of Congress approved—	
June 18, 1878	$200,000
March 3, 1879	200,000
June 14, 1880	170,000
March 3, 1881	175,000
y act of Congress passed August 2, 1882	300,000
y act of Congress approved—	
July 5, 1884	250,000
August 5, 1886	187,500
y act of Congress—	
Of August 11, 1888	350,000
Approved September 19, 1890	370,000
Approved July 13, 1892	225,000
Approved March 3, 1893	750,000
Total	3,177,500

Total expenditures to June 30, 1893, $2,546,214.67, which includes the cost of building shore protections on Sullivan Island and Mount leasant.

The following drawings and papers accompany this report:

Sheet 1. Map showing survey of 1893, profiles of the jetties, and profile showing mparative soundings on axis of dredged cut in 1889 and 1893.
Sheet 2. Comparison of surveys of 1884, 1892, and 1893.
Report of Mr. James P. Allen, assistant engineer.
Table of commercial statistics furnished by the collector of the port.
Statistical letter received from Mr. Edward Willis.

Money statement.

July 1, 1892, balance unexpended		$16,
Amount appropriated by act approved July 13, 1892		225,
Amount appropriated by sundry civil act approved March 3, 1893		750,
		991,
June 30, 1893, amount expended during fiscal year		360,
July 1, 1893, balance unexpended		631,
July 1, 1893, outstanding liabilities	$94, 233. 03	
July 1, 1893, amount covered by uncompleted contracts	885, 405. 62	
		979,
Amount (estimated) required for completion of existing project		1, 203,
Amount that can be profitably expended in fiscal year ending June 30, 1895		750,

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for continuing contract to complete improvement at Charleston bor, South Carolina, received and opened September 23, 1892, by Frederic V. Abbot, C Corps of Engineers.

Bidder.	10,000 tons.	150,000 tons.	40,000 tons.	40,000 tons.	100,000 tons.	40,000 square yards.	50,000 tons.	100,000 tons.	2,000,000 cubic yards dredged.	T
Edward H. Gaynor	$3.00	$2.65	$2.75	$2.75	$2.75	$1.50	$2.70	$2.85	$0.40	$2,
Colin McK. Grant, Charleston, S. C.	2.61	2.36	2.41	2.38	2.33	1.07	2.45	2.50	.31	1,
George W. Egan, Charleston, S. C., and Jacob Friday, Pittsburg, Pa.	3.20	2.25	2.30	2.30	2.30	1.25	2.35	2.35	.28	1,
Henry Oliver, Charleston, S. C.	2.85	2.60	2.85	2.85	2.85	1.25	2.60	2.85	.50	2,
Alabama Dredging and Jetty Co., Montgomery, Ala.	3.50	2.55	2.65	2.65	2.65	1.48	2.55	2.70	.34½	2,
Hasell W. Crouch and Edward P. Crouch, Charleston, S. C.	2.75	2.75	2.75	2.75	2.80	.75	2.75	2.90	.30	2,

Contract (dated October 4, 1892) awarded to Egan & Friday.

REPORT OF MR. JAMES P. ALLEN, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Charleston, S. C., June 30, 1

CAPTAIN: I have the honor to submit the following annual report for Char
Harbor, South Carolina, for the fiscal year ending June 30, 1893.

No stonework was done until November 1, 1892, when operations were
under the contract of Egan & Friday. During the cessation of work the G
ment stone plant was repaired and put into good condition. As under the te
their contract dated October 4, 1892, this plant was leased to Egan & Frida
they having already on hand a plant of their own, operations were very pro
begun at the time above stated.

The north jetty has been widened with stone in sizes of 10 to 500 pounds
2,009 to 5,760 feet from the shore end. This stone was distributed over 40
each side of the jetty, leaving the central 40 feet without any additional cov
The layer of stone varied in thickness from 18 inches to 3 feet, that 18 inches
being only partially finished. There have been used at this place 38,824 tons of
The central 40 feet has been brought up to low water from 5,547 to 5,760 fee
shore end, using 946 tons of stone. The high portion of the north jetty h
reinforced with stone in sizes from 500 pounds to 7 tons, and extending from 7
12,000 feet from the shore end, using 38,118 tons of stone. The south jetty h

brought up to high water with stone in sizes from 250 pounds to 7 tons, extending from 6,900 to 9,075 feet from the shore end. Thirty-six thousand six hundred and sixty-nine tons of stone have been placed here. The outer end of the south jetty has been raised to high water, beginning at 14,140 feet and ending at 14,833 feet, and again from 15,736 to 16,355 feet from shore end with stone from 1 to 7 tons in weight. There have been deposited at this place 13,555 tons. The outer end of the north jetty has been raised with stone 1 to 7 tons in weight beginning at 12,760 feet and ending at 14,236 feet from the shore end. The number of tons used is 20,316. The shore end of the south jetty on Morris Island was raised to high water with stone of not less than 1 ton and up to 7 tons in weight, beginning at 169 feet and ending at 650 feet from shore end. The quantity used was 4,054 tons. The north jetty has been raised between 5,700 and 6,713 feet from shore. The crest is somewhat above low water at the inner end and rises to the general height of the high parts at 6,713 feet. The stone used was generally under 2 tons in weight and 7,074 tons were deposited. The total number of tons deposited during the fiscal year was 106,278 on the north jetty and 54,278 on the south jetty. The stone on both jetties has been piled up to a height of 8 to 12 feet above low water with a narrow crest as heretofore, experience showing that this will be thrown down by wave action and ultimately assume a stable cross section. On the Morris Island shore the crest is designed to be 15 feet wide on top. The stone used is a hard granite from quarries near Edgefield, S. C., 144 miles from Charleston, and near Columbia, S. C., 130 miles from Charleston. Some stone for widening the north jetty was brought by vessel from New York. This is a mica schist, and but a small quantity of it has been used.

The contractor's stone plant consisted of one tugboat, two hoisters, eight lighters carrying usually about 175 tons, and three derricks, rented by terms of contract from the United States; also two tugboats, two hoisters, ten lighters of about 120 tons, five lighters of about 250 tons and two self-propelling revolving cranes for unloading stone from cars. They control the quarries near Edgefield, one of which with its machinery is rented from the United States, and in addition purchase rock from parties near Columbia, S. C. The dredge *Charleston* has also been leased and run by the contractors since the initiation of their contract. She has, however, worked continuously, except such time as was necessary for repairs, since July 18, 1892, when she returned from New York, having been supplied with a new and larger boiler. She has removed during the year 325,222 cubic yards of material. Her maximum month's work was 46,141 cubic yards. The quantity taken out under the contract of Egan & Friday was 269,070 cubic yards.

Appended to this report is a letter by Capt. E. O. Patterson, who commands the *Charleston*, describing certain improvements in the machinery which have greatly increased her capacity.

Surveys.—During the year considerable surveying has been done. The shores of Morris and Sullivan islands were run in for the high and low water line of those portions which are not annually examined. Government reservations in this harbor were also surveyed, and the Fort Sumter and Fort Moultrie surveys were completed mainly by the jetty force during the cessation of work. Cross sections of the inner low portions of both jetties were made extending for 300 or 400 feet on both sides of the center line. Current measurements were made by you between the outer ends of the jetties. The Fort Sumter Shoal was sounded quite thoroughly; the usual soundings were made in the jetty channel and some were taken to the north and south of the jetties. Those parts of the shores of Morris and Sullivan islands which are usually surveyed were run in during March, 1893. Two sheets have been prepared for your annual report. No. 1 is a chart showing soundings on the Fort Sumter Shoal, cross sections of the jetties, and soundings in the jetty channel and outside of the jetties. It also shows the positions and profiles of the jetties, a profile of the dredge cut compared with a profile on the same line, from the survey of 1889, and portions of Morris and Sullivan islands. Sheet No. 2 gives a comparison of the jetty channel between 1884, 1892 and 1893.

Fort Sumter Shoal.—This was fully surveyed in 1884 and in 1888. Compared with 1888: The area of less than 9 feet to the south and east of the fort has increased slightly while the 12-foot area has not changed materially. There has, however, been a noteworthy change in the shapes of these curves. In 1888 a point made down from this shoal toward the south jetty so that the 12-foot curve came within 2,000 feet of this jetty, and the 9-foot curve about 2,800 feet from it. Now this point has disappeared and a new and isolated shoal of considerable extent between 12-foot curves has formed out to the north and east leaving a channel between it and the main shoal with not less than 12 feet at low water. To the westward of this channel the curves have moved west. A deep hole of over 18 feet which formerly appeared here has now disappeared giving place to shoaler water. Some of these points were brought out by the survey of 1892, but as stated in my report upon this survey it did not extend sufficiently far north to enable us to study these changes fully. The strong flood tide over the south jetty may account for the chang noted, and these changes may have been more rapid as the progress of work on th south jetty increased the flood velocity. There is on the north side of this jetty a increase of the trench formation due to overpour during flood which confirms th indication of increased flood currents.

Current measurements in Swash Channel.—These were made with a current mete the same apparatus being used and methods followed as in 1890. The same poin were occupied. They are designated on the map of 1890 as No. 1, No. 2, and No. which are respectively near the north jetty about half way between jetties a near the south jetty, and are about 2,000 feet inside the outer end of the nort jetty. The mean ebb velocity is shown to have been about 1.8 times greater th in 1890. The ebb velocities at No. 2 and No. 3 were generally greater in 1890 tha at No. 1, while in 1893 at No. 1 and No. 3 they were about equal and greater than No. 2. The mean flood velocities seem to be about 1.4 times greater, but not mar flood measurements were secured. These flood velocities are still very moderate compared with the ebb velocities, bearing the relation to these ebb velocities of ab 1 to 1.6. The ebb velocity in Swash Channel in 1893 seems to be as great as it wa through the Main Ship Channel in 1890.

Deep Pocket.—A gradual filling up of the Deep Pocket, south of the south je and 8,500 feet from its shore end, continues. The formation of a deep hole at th point caused considerable anxiety some years since. There does not at this ti seem to be any reason for apprehension at this point.

Mean soundings.—The mean soundings have been calculated for Swash Chann. but no profiles have been prepared for them this year. These mean soundings ha also been extended so as to enable us to compare changes on Drunken Dick Sh. The areas just to the north and south of the jetties are also compared. The comparison in Swash Channel is between 1892 and 1893, and also between 1884 and 18; on Drunken Dick Shoal between 1884 and 1892, no survey of this having been ma this season; to the north and south of the jetties between 1884, 1892 and 1893. In studying the movement of material by these mean soundings the area betw the jetties and beyond has been divided into squares as heretofore. The squares a in three rows or zones of sixteen in each row. One of these zones is along the nort jetty, one midway between the jetties, and the third is along the south jetty. The squares are 930 feet on the side and the three zones thus fill the space between je ends. They are prolonged inward and outward so that of each zone there are ab five squares beyond the present ends of the jetties, five along the outer parallel and six on the inward extension of the opening between the jetties. We will c these zones No. 1, No. 2, and No. 3, the first being near the north jetty. Compar changes between 1892 and 1893 in cubic yards, we have the following: No. 1. The inner six squares in this zone show an aggregate fill in excess of scour of 44,844 cu yards; the five squares along the jetty show a scour of 243,443 cubic yards; and outer five squares show a fill of 131,331 cubic yards; or a total scour on this zone 67,268 cubic yards. No. 2. The inner six squares show 19,219 cubic yards fill. next five 169,770 cubic yards scour, and the outer five 156,956 cubic yards fill 6,405 cubic yards excess of fill over scour on this zone. No. 3. The inner six sh 3,203 cubic yards fill, the next five show 278,679 cubic yards scour and the outer 147,446 cubic yards scour; 422,922 cubic yards excess of scour over fill. The total ex of scour over the whole area is 483,785 cubic yards. The aggregate fill over the in six squares for Nos. 1, 2, and 3 (eighteen squares) is 67,266 cubic yards; the aggrega scour over the next five for Nos. 1, 2, and 3 (fifteen squares) is 691,892 cubic yar; and the fill on the fifteen outer squares 140,841 cubic yards.

The comparison of this area for 1884 and 1893 will be less in detail. The inner squares of all zones (eighteen squares) show a scour of 618,217 cubic yards. The fifteen squares next seaward, which are those between the parallel outer portions the jetties, show a scour of 1,585,585 cubic yards. The outer fifteen squares sho fill of 1,140,339 cubic yards. This gives a total scour from 1884 to 1893 of 1,06 cubic yards. The wedge-shaped area between the inner six squares of No. 3 and south jetty shows the scour and fill about evenly balanced between 1884 and 18. The aggregate scour from 1884 to 1893, over an area covering a large part of Drunk Dick Shoal, was 306,876 cubic yards.

North of the north jetty and near its outer end the average soundings over a certain area near the jetty were 13.3 in 1884, 12.3 in 1892, and 11.9 in 1893, showing progressive shoaling.

South of the south jetty and near its outer end the average depth for a cert area adjacent to the jetty in 1884 was 11.9, and for the same area it was 12.1 in 1 and 11.5 in 1893. In five squares beyond the end of the south jetty and mainly the south of its center line the average of all soundings was 16.8 in 1884, 17. 1892, and 15.5 in 1893.

Dredging will account for a large portion of the material removed from the channel between 1892 and 1893. Some of it may have found its way beyond the li he jetties, largely to the southward. The filling on the inner squares between 1892 nd 1893 is not large enough to cause anxiety, especially as there is a decided scour ndicated here from 1884 to 1893. The movement of material from Drunken Dick shoal between 1884 and 1892 is considerable, but it is by no means certain that this worked its way down the channel. It is quite possible that some of it went over he north jetty, which at this locality is but slightly raised above the average eight of the shoals to the northeast. The total area north and east of the north etty does not, however, show any marked change, at least so far as the limitations f the survey enable us to study this matter in the aggregate amount of material emoved.

Curves in swash or jetty channel.—The following changes in the curves of 1893, as compared with 1892, seem worthy of attention. The inner 18-foot curve has moved out. The inner 15-foot curve between outer portions of the jetties has also moved out. There is now shown a distinct and straight 15-foot channel entirely through rom inside to deep water beyond the bar. This is narrow in places and gives a lear definition of the line of the dredged cut. Along this line the 18-foot curve is lso through, except about 1,800 feet near the large red buoy and about 800 feet at he outer end. All of the outer curves have moved outward from 500 to 1,000 feet n the south side and near the line of the south jetty. Near the north jetty this ushing outward has not been so great. The area of more than 15 feet between the etties and just beyond their ends has increased greatly, and notably near the line f the south jetty. Several deep holes of 15 feet and over have appeared nearly long the line of the old swash channel as it existed before the north jetty was uilt. The axis of these holes passes near the north jetty. Greater activity of cour is indicated, however, on the south side near the line of the south jetty than long this line. The 15-foot curve near the north jetty and about a mile inshore rom its outer end has not advanced seaward. The area of more than 18 feet has rgely increased and now extends beyond the limits of the dredged cut towards he south jetty. The changes in this and in the 15-foot curve in this vicinity are o great to be accounted for by the 300,000 cubic yards taken out by the dredge t the time of the survey. Last year there were four shoals of less than 9 feet between the outer ends and beyond, one near the north, and the others near the south etty in prolongation of its center line. Of the latter, one has not changed greatly n size, but is somewhat farther seaward, and the other two have disappeared from he area in question. The shoal near the north jetty disappeared, but there are everal shoals south and east of its position, the aggregate area of which is at least wice that of the shoal shown in 1892. One of these has very nearly the same size and hape, and is approximately parallel to, the old shoal. The area of less than 12 feet etween the lines of the jetties is about 20 per cent less than last year. A large part f this change is due to the movement of material to the south of the prolongation f the axis of the south jetty.

The indications this year point, as they did last year, to the movement of material o the southward. This appears from the shape of the dredged cut curves which are raight and parallel to the cut on the north side and are irregular and far removed om this cut on the south side. The relative positions of the shoals of 9 and 12 feet n 1892 and 1893 also point to the same conclusion.

North of the north jetty the curves have changed very slightly, hardly noticeably, xcept near the end of the north jetty, where there is a slight outward movement. outh of the south jetty the only conspicuous changes are evidently due to the material which, as already noted, has moved out of the channel.

Condition of the jetties.—The general profiles of the jetties are given as heretofore n sheet No. 1, and also the profiles along the dredged cut in 1889 and in 1893 superposed. The cross sections of the jetties do not show any marked changes in the etties themselves nor in their surroundings. The trench formation near the south etty between the Main Ship Channel and Morris Island increases. This increase is ore on the north than on the south side, indicating greater activity in the flood han in the ebb currents. No settlement is indicated in the jetties, but those portions of the outer ends which were brought up to high water and above have been owered by the action of the sea, as was anticipated, in some parts to but little above han low water.

Sullivan Island.—The high water and low water lines at the western end of this land have changed very slightly. Near the north jetty the shore lines have eceded. Between the north jetty and the Bowman Jetty they have generally advanced very slightly, except near the Bowman Jetty, where they have slightly eceded. West of the Bowman Jetty there is no change worthy of note. The survey of the eastern part of this island, compared with the survey of 1884, shows that here has been an advance of the shore line. This is generally from 50 to 100 feet, he maximum being about 300 feet. At the extreme eastern end there has been ttle or no change.

Morris Island.—The head of the island has changed but slightly. The high-water shore line has made up to the north at the extreme end about 100 feet. the front this line is almost identical with that of last year for some dista from the head of the island. Near the south jetty it has made out over 100 fee places. South of the jetty it has not changed greatly. The survey made last su mer of the southern portion of this island shows that the shore lines are recedi This amounts to about 250 feet at 2,500 feet south of the jetty. From 4,000 to 11, feet south of the jetty it will average for the high water about 125 feet. Fr 11,700 feet to 15,000 feet south of the jetty there has been a slight advance of shore line. At the extreme southern end there has been a marked receding of b high and low water shore lines.

Mount Pleasant Shore.—No work has been done during the year. The breakwa built in 1892 and the jetties built in 1884 are in fair condition.

Wreck.—The three-masted schooner *Kate V. Aitken* was wrecked on the bar bey the ends of the jetties and about 800 feet from the dredged cut on March 9, 1 She afterwards shifted her position to the location where she is shown on sheet N accompanying your report.

Employés.—Mr. J. E. Mikell has been the chief inspector during the term of tract work. He has been assisted by Mr. W. D. Gaillard, Mr. W. M. Smith, and R. T. Crawford. Col. F. L. Childs has been inspector on the dredge. Mr. W. A. Leland has filled the position of additional inspector, while also discharging h duties of property clerk. Col. William Butler has inspected the unloading of the su from cars to lighters. The stone shipped from Columbia and Edgefield has weighed by Mr. J. B. DeSaussure and Mr. George T. Sandford. Surveys have been by myself, Mr. L. L. Gaillard, Mr. W. A. Leland, and Mr. W. D. Gaillard. gentlemen associated with me have all discharged their duties with reasonable and accuracy. Some of them have shown more than ordinary interest in their w A few mistakes have been made, none, however, serious in their nature or resul.

Very respectfully, your obedient servant,

JAMES P. ALLEN,
Assistant Engin

CAPT. FREDERIC V. ABBOT,
Corps of Engineers, U. S. A.

REPORT OF MR. E. O. PATTERSON.

CHARLESTON, S. C., *June 7, 18*

SIR: I have the honor to report to you on the success of the drag designed by myself and placed on the *Charleston* March 21, 1893.

The old drag was too small in the mouth, the opening being 4 inches, which caused the pump to choke most of the time. Then again the water valve to relieve the choking was on the back of the drag, and it was stationary. As the drag chokes at the mouth the valve ought to be as near the mouth as possible. The new drag has a 6-inch opening and has easier curves for the entrance of the sand. The water valve is on the forward side of the drag, 2 inches above the mouth, and is protected from the bottom by a three-fourths-inch piece of steel extending from the mouth to the flange. The valve is 2 inches by 3 feet and has an 18-inch steel handle with a 25-pound weight to close it. The valve is opened from the top of the house by a small line running through a block in the tressel, and then to the top of the house. With the old drag, when it would choke, we were obliged to raise the suction and stop the pump to clear the pipes. This would occur five or six times a load and would take about two minutes each time. With the new drag, when it chokes, we raise the valve and the pipes clear themselves at once. The new drag has increased the rate of pumping from 5 to 8 yards per minute, averaging 2,000 yards per day up to the present time, against 1,000 per day with the old drag. The new drag is flanged about 18 inches from the mouth, so when the mouthpiece is worn out you can put on a new one and save the expense of getting a whole new drag. It also has an adjustable scraper, which I find works very nicely on this bar where the material is so changeable. I will give you the days' works in March four days before the new drag was put on and four days after, showing the increase:

	Old drag.		New drag
	Cu. yds.		*Cu. yds.*
Mar. 16	1,720	Mar. 22	2,3
17	1,482	23	2,5
18	1,378	24	2,45
20	1,788	25	2,1

The car springs placed in cages on each side of the rubber suction have proved ry successful in relieving the heavy strain that comes on the suction at times, ich has a tendency to break the spiral spring in the suction. The springs are inches in diameter, 1 foot long, and are tested to a strain of 3 tons each. They are nected to the suction by shackles and a five-eighths-inch chain. The suction we ve on now has been in use three months and is as good as new, and you know the uble we had with suctions before the springs were put on, using four in less than o months, one lasting six days.

he canvass put on the hips of the bins last October to keep the sand from the ll has succeeded in keeping out the sand far better than I anticipated, not one ticle coming into the hull from the hips up to the present time.

I am, very respectfully, your obedient servant,

E. O. PATTERSON.

Ir. JAMES P. ALLEN,
Assistant Engineer.

COMMERCIAL STATISTICS.

rivals and clearances of vessels and commerce at Charleston, S. C., from January 1, 1875, to December 31, 1891.

ARRIVED.

Year.	Coastwise.			Foreign ports.						Total.		
				American vessels.			Foreign vessels.					
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.
	504	382,018	11,949	38	13,144	326	198	88,879	2,404	740	484,041	14,379
	471	340,439	10,113	44	11,898	335	224	101,272	2,768	739	453,609	13,216
	400	324,919	9,885	32	13,972	308	336	105,480	2,851	668	444,371	13,044
	396	322,527	9,623	44	19,935	455	329	163,368	3,967	772	505,830	14,045
	383	326,681	10,027	39	12,505	319	249	121,503	3,292	668	460,659	13,638
	441	388,026	20,641	38	12,412	327	191	110,771	2,595	670	511,209	13,563
	412	399,732	10,377	34	9,430	272	257	121,077	3,073	703	530,239	13,722
	410	384,690	9,446	35	4,807	224	200	105,647	2,648	645	495,144	12,318
	345	277,538	7,629	26	3,002	157	239	113,768	2,958	610	394,308	10,744
	455	304,382	9,822	21	3,910	145	214	134,076	3,269	690	442,368	13,236
	375	268,477	9,637	15	2,344	97	187	106,233	2,586	577	377,054	12,320
	901	550,209	....	20	3,714	131	182	114,507	2,646	1,103	668,403	....
	927	656,949	....	30	7,074	199	127	67,257	1,607	1,084	731,280	....
	*924	601,771	....	34	7,750	252	127	72,921	1,779	1,085	682,442	....
	†330	481,718	9,708	30	6,985	216	136	87,101	1,979	496	575,804	11,903
	‡410	600,776	13,677	35	7,205	242	120	81,518	1,828	565	689,499	15,745
	§417	680,776	15,695	27	4,665	179	150	119,199	2,383	594	804,640	18,257
	‖388	625,880	14,705	28	5,138	193	87	69,091	1,416	503	700,109	16,314

*Of these, 32 vessels (tonnage, 31,035), with crews numbering 608, were foreign.
†Of these, 29 vessels (tonnage, 9,440), with crews numbering 546, were foreign.
‡Of these, 58 vessels (tonnage, 55,533), with crews numbering 1,110, were foreign.
§Of these, 34 vessels (tonnage, 39,078), with crews numbering 717, were foreign.
‖Of these, 31 vessels (tonnage, 30,949), with crews numbering 562, were foreign.

CLEARED.

	461	328,266	10,830	57	24,679	555	211	94,595	2,527	729	447,540	13,912
	431	278,744	9,095	60	23,598	546	230	103,276	2,812	721	405,618	12,453
	335	234,429	7,719	35	22,767	423	250	108,446	2,910	620	365,662	11,052
	266	172,988	5,801	45	24,397	479	398	149,975	3,591	509	347,360	14,045
	287	188,212	6,268	34	11,282	292	278	149,052	3,643	599	348,546	10,203
	296	190,733	6,348	45	23,210	481	246	155,768	3,375	587	369,711	10,204
	268	187,569	5,942	32	9,239	255	278	153,796	3,464	578	350,604	9,661
	147	113,699	3,690	40	7,375	273	263	158,250	3,584	450	379,324	7,546
	98	48,714	2,018	27	4,560	181	299	154,653	3,815	424	207,927	6,014
	212	116,020	4,555	31	7,845	217	276	161,588	3,727	519	285,453	8,499
	191	99,658	5,047	24	5,217	164	204	119,602	2,836	419	224,467	8,047
	890	543,259	....	25	5,469	165	201	126,943	2,875	1,116	675,671	....
	888	610,646	....	28	5,837	189	173	115,218	2,546	1,089	731,701	....
	*911	580,468	....	30	5,848	211	144	96,146	2,105	1,085	682,462	....
	†46	356,596	778	25	5,080	174	165	112,037	2,495	236	155,713	3,467
	‡21	12,863	292	41	10,161	318	166	126,078	2,676	228	149,102	3,286
	§39	21,197	436	32	6,887	216	164	143,398	2,809	255	171,482	3,461
	‖26	29,752	565	28	5,760	197	111	89,390	1,798	165	124,902	2,560

*Of these, 7 vessels (tonnage, 4,295), with crews numbering 62, were foreign.
†Of these, 4 vessels (tonnage, 2,960), with crews numbering 47, were foreign.
‡Of these, 7 vessels (tonnage, 6,180), with crews numbering 135, were foreign.
§Of these, 18 vessels (tonnage, 16,332), with crews numbering 303, were foreign.
‖Of these, 13 vessels (tonnage, 15,068), with crews numbering 261, were foreign.

Arrivals and clearances of vessels and commerce at Charleston, S. C., from January 1875, to December 31, 1891—Continued.

COMMERCE.

Year.	Value of exports.	Value of imports.	Duties collect
1875	$19,655,966	$680,343	$80,65
1876	18,088,152	455,562	89,16
1877	16,917,492	161,237	46,81
1878	21,167,575	184,127	36,99
1879	18,693,126	127,981	24,07
1880	24,939,259	248,158	46,45
1881	21,927,269	723,049	99,06
1882	19,907,099	459,970	45,26
1883	20,144,365	467,648	48,76
1884	20,833,424	503,504	36,6
1885	15,157,889	588,191	32,7
1886	17,410,000	635,000	24,87
1887	15,288,316	484,063	30,81
1888	13,006,578	625,770	76,39
1889	16,080,255	664,696	16,7
1890	15,204,771	836,626	18,
1891	21,906,076	1,204,588	24,3
1892	11,460,681	368,926	15,4

T. B. JOHNSTON,
Collecto

LETTER OF MR. E. WILLIS.

CHARLESTON, S. C., *May 31, 18*.

City of Charleston.—The business during the past year has, in many branches, shown great activity and some decided improvement in volume which is not likely to desert us another season, as the advantages of the city for promptly handling the cotton, truck, farm produce, lumber, cross ties, the very heavy grocery business, and immense fertilizer and phosphate industry is so noticeably improved for economy and dispatch, as our water front now glitters with the very best character of wharves, railroad storehouses, which have long been needed and now so advantageously used for the largely increasing truck-cotton business requiring quick handling and prompt delivery by railroads north and west.

The East Shore Terminal Company has developed into a necessity, for we could not hold our business without it. It enables the early vegetables to be received in the morning and shipped same day. The East Shore Terminal Company is one of the greatest factors in Charleston's advancement. This company not only owns and operates the Union and Commercial cotton compresses, but has a line of railway connecting with all the railroads running into Charleston, extending along the water front and onto many of the piers and storage-houses along the same. Cotton, lumber, etc., loaded in the country, is now discharged on the pier within reach of the ship's tackle, and from the car it was originally loaded into, thus avoiding the old practice of draying through the streets.

The West Shore Terminal.—This important feeder of the South Carolina Railroad is located on the Ashley River, and is the pioneer enterprise in the great race for close connection between the railroads and the shipping in this port. The docks are commodious and secure, this point in the city's water front being perfectly protected by the high hills of the Accabee on the northeast and the forests of St. Andrews on the southwest. This anchorage was selected by the original settlers in South Carolina where the old Charlestown was laid out on account of its security, and vessels now seek its protection in stress of weather. The principal business conducted at this point consists largely of fertilizers, rock, lumber, and salt, the latter article being handled here in vast quantities.

Export trade of Charleston from January 1, 1892, to December 31, 1892.

	Number.	Tons.	Value.
Upland cotton........bales..	512,000	128,000	$20,000,000
Sea Island cotton........bags..	11,500	1,600	1,000,000
Rice........bushels..	867,000	18,000	800,000
Rosin........barrels..	150,000	30,000	300,000
Turpentine........casks..	28,000	4,500	460,000
Phosphate rock, crude........tons..	355,000	355,000	1,800,000
Phosphate rock, ground........do...	4,000	4,000	30,000
Fertilizers........sacks..	2,220,000	220,000	3,500,000
Lumber, shingles, timber, cross-ties........feet..	60,000,000	1,200,000	750,000
Cotton goods, domestic, and yarns........bales..	80,000	20,000	4,500,000
Cotton seed, meal, and cake........tons..	2,800	2,800	55,000
Kaolin........casks..	14,000	12,000	125,000
Vegetables and fruit........crates..	175,000	8,000	350,000
Strawberries........quarts..	650,000	650	65,000
Potatoes........barrels..	100,000	9,000	500,000
Melons........carloads..	1,001	36,000	160,000
Miscellaneous........	....	80,000	125,000
Total........	....	2,129,550	34,520,000

Imports from January 1, 1892, to December 31, 1892.

	Number.	Tons.	Value.
Bacon........pounds..	60,000,000	30,000	$4,500,000
Flour........barrels..	175,000	18,000	900,000
Corn........bushels..	800,000	26,000	490,000
Hay........bales..	60,000	5,500	75,000
Oates........bushels..	270,000	3,600	115,000
Grist and meal........barrels.	110,000	10,000	300,000
Sugar........do....	90,000	15,000	1,200,000
Molasses........do....	7,500	1,250	150,000
Salt........sacks..	40,000	10,000	25,000
Cotton bagging, Sea Island........yards..	40,000	45	7,500
Cotton bagging and burlaps........do....	6,000,000	9,500	650,000
Jute butts, 8,788,571 pounds........bales..	20,920	4,460	176,972
Petroleum and other oils........barrels..	8,000	1,500	80,000
Ice........tons..	38,000	38,000	130,000
Cigars........number..	12,000,000	2,200	800,000
Tobacco........pounds..	1,500,000		
Paper, stationery, etc........	1,800	1,800	380,000
Groceries and dry goods........	115,000	115,000	24,000,000
Hardware........	72,000	72,000	2,500,000
Boots and shoes........	13,500	13,500	1,300,000
Crockery........	7,000	7,000	300,000
Drugs and medicines........	3,600	3,600	800,000
Stone, granite, rubble, marble, brown stone........tons..	....	101,544	273,260
Curbing and paving........	....	3,500	
Kainit........	....	6,905	275,284
Sulphur brimstone........	....	8,990	
Nitrate of soda, manure, salt........	....	50	
Muriate of potash........	....	1,595	
Pyrites........	....	11,865	
Lime and cement, bricks........	....	13,000	33,000
Manufactures........	....	30,000	13,000,000
Fertilizers........	....	418	4,180
Total........	....	535,404	52,465,196

Tonnage in 1892.

	Foreign.	Domestic.	Total.
Steamships........	71	299	....
Barks........	57	2	....
Brigs........	11	15	....
Schooners........	3	403	....
Total........	142	719	861

M II.

IMPROVEMENT OF ASHLEY RIVER, SOUTH CAROLINA.

REFERENCE TO PAST REPORTS.

For preliminary examination see Appendix S 8, Annual Report fo 1873.

ORIGINAL CONDITION.

The river was obstructed by two shoals, with not over 9 feet of wate on them.

PLAN OF IMPROVEMENT.

A depth of from 10 to 11 feet was to be secured by dredging.

WORK PRIOR TO JUNE 30, 1892.

Twenty-two thousand one hundred and twenty-four cubic yards material had been removed, and the desired depth had been obtain and maintained. Dividing the total expenditures for all purposes June 30, 1892, by the above number of cubic yards dredged, shows th cost to have been 21 cents per cubic yard. All dredging was done b contract.

WORK OF PAST YEAR.

Advantage was taken of a favorable opportunity to get some dred ing done very cheaply, and 4,001 cubic yards were removed from C Head Shoal, which had not retained the full depth required. Th practically exhausted the funds available for this stream. The ba ance on hand July 1, 1893, $2.81, is held to pay for telegrams whi have been sent by the Western Union Telegraph Company, for whi they refuse to accept the price allowed by the Postmaster-General.

REMARKS.

No new transportation lines have been established on this river du ing the year. The improved reaches are in satisfactory condition.

Appended to this report is a statement prepared by Mr. E. Willis, Charleston, giving the required freight statistics. During the ye the freight passing over this stream has aggregated 465,000 tons.

This river is tributary to the collection district of Charleston, S. C. Charlest is its port of entry. Amount of duties collected in the calendar year of 18 $15,494.24.

For this improvement the following appropriations have been mad

By act of Congress approved—	
June 14, 1880	$1,0
March 3, 1881	1,5
July 5, 1884	2,0
August 5, 1886	1,0
Total	5,5

Total expenditures to June 30, 1893, $5,497.19.

Money statement.

July 1, 1892, balance unexpended	$826.
June 30, 1893, amount expended during fiscal year	823.
July 1, 1893, balance unexpended	2.8
July 1, 1893, outstanding liabilities	2.8

REPORT OF MR. JAMES P. ALLEN, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Charleston, S. C. June 30, 1893.

CAPTAIN: I have the honor to submit the following annual report for Ashley River, South Carolina:

Examinations of the two shoals upon which work had been done were made on July 14, 1892. These showed a good channel nearly 12 feet deep at low water through the Stono Shoal about 6 miles from Charleston, but there was only about 9 feet at low water in the channel through the shoal near the old Wando Works, about 9 miles from Charleston. The former had been dredged in 1886, and the latter in 1882, to 12 feet and 11 feet respectively.

A balance of about $800 remained from the appropriation made in August, 1886, which had been kept by you from year to year, as there was no urgent demand for dredging and because the sum was too small to enable you to do much at either place.

In October, 1892, one of the dredges belonging to Mr. P. Sanford Ross, of Jersey City, N. J., passed through Charleston and was employed by you at a very reasonable rate to dredge upon the upper shoal, commonly known as "Cowhead Shoal," to the extent that the funds available would allow. From October 11 to 14 this dredge removed 4,001 cubic yards of sand and mud, making a single cut through the shoal about 45 feet wide and 900 feet long.

On May 23 I examined this shoal by sounding and found a narrow channel of about 10 feet depth at low water.

Further dredging will undoubtedly be necessary at this place if it is contemplated to maintain a depth of 10 feet at low water, or to secure 11 feet, as was done at the time it was originally dredged.

Very respectfully, your obedient servant,

JAMES P. ALLEN,
Assistant Engineer.

Capt. FREDERIC V. ABBOT,
Corps of Engineers, U. S. A.

COMMERCIAL STATISTICS.

LETTER OF MR. E. WILLIS.

CHARLESTON, S. C., *May 31, 1893.*

This stream shows the greatest activity of any in our State, being short and both sides having phosphate mines and fertilizer companies on its banks almost its length, and here is where we are getting our increased business from. The new companies put up to make commercial manures, and these using pyrites instead of sulphur, greatly increasing tonnage over this river. Vast sums of money have been expended building new works, and some very expensive improvements been made to existing companies, and this is likely to occur once during each year, and give employment to many people, and requires considerable sums of money each year to make them.

Commercial statistics, Ashley River, South Carolina.

	Phosphate rock.		Sulphur, kainit, blood, potash, cotton-seed meal, pyrites tankage, etc.		Timber, lumber, shingles, cross-ties, hoop poles, etc.		Miscellaneous.		Total value.
	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	
1888...	....	$1,045,000	....	$750,000	....	$30,000	....	$25,000	$1,850,000
1889...	....	1,200,000	....	800,000	....	35,000	....	30,000	2,065,000
1890...	250,000	1,600,000	50,227	900,000	10,000	40,000	5,000	40,000	2,580,000
1891...	300,000	2,100,000	98,800	1,016,000	12,500	50,000	4,500	30,000	3,196,000
1892...	310,000	1,600,000	125,000	1,250,000	20,000	125,000	10,000	50,000	3,025,000

M 12.

IMPROVEMENT OF WAPPOO CUT, SOUTH CAROLINA.

REFERENCE TO PAST REPORTS.

For original project, see p. 1073, annual report for 1881. For mod ified project, see p. 1196, annual report for 1889.

ORIGINAL CONDITION.

Wappoo Cut was a narrow, crooked tidal stream, with but littl depth, connecting Ashley and Stono rivers.

PLAN OF IMPROVEMENT.

The project provides for securing a sufficiently straight and contin ous channel 60 feet wide between low-water lines and 6 feet deep low water from Ashley to Stono rivers. The bulk of the work is dred ing. To maintain the channel two training walls at Stono entran and three closing dams are to be made and some bank protection don The estimated cost is $88,000.

WORK PRIOR TO JUNE 30, 1892.

One hundred and seventy thousand seven hundred and nine cu yards of dredging had been done. A number of snags, stumps, a overhanging trees had been removed, and a bulkhead had been bui across the mouth of Pompey Cut. The south side of Elliott Cut ha been revetted with stone for a length of 1,300 feet, at a cost of $3,1 or $2.38 per running foot. Dividing the balance of the total expend tures for all purposes to June 30, 1892, by the above number of cu yards excavated, shows that the average cost per cubic yard for dred ing has been 22 cents. All work has been done by contract.

WORK OF PAST YEAR.

A brush and stone dam 220 feet long was built to close the old ro just east of Elliott Cut. Eight hundred feet of the north bank Elliott Cut was revetted with stone, and 460 feet more were protect at the foot of the slope. Considerable dredging was done at two poi where insufficient depths existed.

REMARKS.

No new transportation line has been established through this during the year. During the year the freight passing over this strea has aggregated 141,000 tons.

The balance of $2,715.72 on hand July 1, 1893, will be held in hand maintain the present channel by dredging at any point that may b come shoal.

This work is in the collection district of Charleston, S. C., which is the port entry. Amount of duties collected in the calendar year of 1892, $15,494.24.

The following appropriations have been made for this improvement:

By act of Congress—	
Approved March 3, 1881	$10,000
Passed August 2, 1882	10,000
Approved July 5, 1884	3,000
Approved August 5, 1886	5,000
Of August 11, 1888	5,000
Approved September 19, 1890	10,000
Approved July 13, 1892	10,000
Total	53,000

Total expenditures to June 30, 1893, $50,284.28.

Money statement.

July 1, 1892, balance unexpended	$2,583.23
Amount appropriated by act approved July 13, 1892	10,000.00
	12,583.23
June 30, 1893, amount expended during fiscal year	9,867.51
July 1, 1893, balance unexpended	2,715.72
Amount (estimated) required for completion of existing project	35,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	35,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

Abstract of proposals for dredging in Wappoo Cut, South Carolina, received and opened at 12 o'clock noon of September 9, 1892, by Frederic V. Abbot, Captain, Corps of Engineers.

No.	Name of bidder.	Amount of material.	Price per cubic yd.	Total.
		Cubic yds.	*Cents.*	
1	Savannah Dredging Co	30,000	30	$9,000
2	P. Sanford Ross	30,000	27.6	8,280
2	do	30,000	*23	6,900
3	Thomas Young	30,000	23	6,900

*This price if paragraph 36, sections 1 and 2, does not apply.

Contract (dated September 16, 1892) awarded to Thomas Young.

Abstract of proposals for revettment, etc., at Wappoo Cut, South Carolina, received and opened at 12 o'clock noon of September 9, 1892, by Frederic V. Abbot, Captain, Corps of Engineers.

No.	Name of bidder.	Stone on bank.		Stone in dam.		Mattress in place.		Total.
		Cubic yards.	Per cubic yard.	Cubic yards.	Per cubic yard.	Square yards.	Per sq. yard.	
1	Thomas Young	1,300	$3.10	600	$3.10	700	$1.10	$6,660

Contract (dated September 18, 1892) awarded to Thomas Young.

REPORT OF MR. JAMES P. ALLEN, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Charleston, S. C., June 30, 1893.

CAPTAIN: I have the honor to submit the following annual report for Wappoo Cut, South Carolina:

Two contracts dated September 16, 1892, were awarded to Mr. Thomas Young, of Charleston, S. C.—one for building a brush and stone dam and revetting the banks of Elliott Cut with stone, and the other for dredging at such points as might be required.

The work on the dam was begun on October 4, 1892. It is 220 feet long and closes the old route just east of Elliott Cut. The purpose of this dam is to force all of the water through the Marsh Cut of 1891 to prevent, if possible, the formation of shoals at its ends. The foundation is of mattresses of brush, held between frames of scantling and 3 feet thick before receiving the load of stone. The stone was placed upon these mattresses in a pile of approximately triangular cross section. The top of the dam is about at high water level.

Eight hundred feet of the bank on the north side of Elliott Cut was graded and revetted with stone, and 460 feet more had the foot of the bank protected by a longitudinal stone pile. On the south side the old revetment was reënforced for about 200 feet.

Dredging was begun October 21, 1892, at the west end of the Marsh Cut of 1883. Thirteen hundred and ninety-seven cubic yards were taken out in this vicinity and dumped in Devils Elbow, which is comparatively deep and is now but little used. The Marsh Cut of 1891 was widened by dredging along its north bank and some material was removed from its entrances. Eleven thousand six hundred and eighty-six cubic yards were taken out in this vicinity and dumped partially in Stono River, about one-third of a mile south of Elliott Cut, and the balance as near as it could be gotten to the dam, which had been previously built, and on both sides of it.

Mr. Young's contract for dredging was closed at the time specified, but his contract for stone work was extended one month.

An examination of the improved portion of this creek was made by soundings taken April 21, 1893. Just west of the Marsh Cut of 1891 there is a shoal with 5 feet on it at low water. With this exception there is not less than 6 feet in the channel. A previous survey showed one small lump at the east end of the Marsh Cut of 1891, which may still exist and have been passed over in the last examination. It is small; there is deep water all around it, and it causes no trouble.

December 16, 1892, a survey with located soundings was made of the shoal at the Ashley mouth of Wappoo Cut. This showed a 6-foot channel through the shoal about 55 feet wide at the narrowest point.

The work was inspected by Mr. R. T. Crawford, assisted by Mr. R. I. Hassell. These gentlemen both deserve credit for their faithful and judicious supervision of the work.

Very respectfully, your obedient servant,

JAMES P. ALLEN,
Assistant Engineer.

Capt. FREDERIC V. ABBOT,
Corps of Engineers, U. S. A.

COMMERCIAL STATISTICS.

LETTER OF MR. E. WILLIS.

This greatly improved inland route to the Sea Islands, Beaufort, Savannah, and Florida now allows vessels to go in and out with about same regularity of any of our tide streams, and now even a pleasant route for the pleasure yachts, and no towage dreaded by flatboats or sail craft, or tugs having in tow loaded lighters, for the water is there.

Commercial statistics, Wappoo Cut, South Carolina.

Articles.	1888.		1889.	
	Quantity.	Value.	Quantity.	Value.
Phosphate rock ....tons..	60,000	$300,000	70,000	$475,000
Sea island cotton ....bags..	6,000	360,000	10,000	750,000
Rice ....bushels..	150,000	150,000	250,000	262,500
Vegetables ....crates..	120,000	240,000	80,000	125,000
Fertilizers ....tons..	2,000	30,000	2,500	40,000
Lumber ....feet..	20,000,000	160,000	22,500,000	190,000
Shingles, cross-ties, and other articles	....	....	....	25,000
Total	....	1,240,000	....	1,867,500

Articles.	1891.		1892.	
	Quantity.	Value.	Quantity.	Value.
Phosphate rock ....tons..	75,000	$525,000	65,000	$300,000
Sea island cotton ....bags..	12,000	800,000	10,000	850,000
Rice ....bushels..	240,000	250,000	400,000	300,000
Vegetables ....crates..	90,000	160,000	95,000	200,000
Fertilizers ....tons..	1,400	21,000	3.000	37,500
Lumber ....feet..	25,000,000	200,000	30,000,000	275,000
Shingles, cross-ties, and other articles	....	20,000	50,000	35.000
Total	....	1,976,000	....	1,997,500

M 13.

IMPROVEMENT OF EDISTO RIVER, SOUTH CAROLINA

REFERENCE TO PAST REPORTS.

For preliminary examinations, see p. 1140, Annual Report for 1881. For modified project, see p. 1168, Annual Report for 1889.

ORIGINAL CONDITION.

The river was choked with snags and had many half-formed natural cut-offs.

PLAN OF IMPROVEMENT.

The project provides for snagging, etc., to give easy navigation for rafts and flatboats from Guignards Landing to the mouth of the river, a distance of about 260 miles, at an estimated cost of $33,385.

WORK PRIOR TO JUNE 30, 1892.

The river had been snagged between points 227 miles and no miles above the mouth, 33,407 logs, snags, and overhanging trees, etc., having been removed from the channel and banks. Numerous outlets into the swamps had been closed, and one large natural cut-off had been opened and made the main channel of the river.

The river and harbor act of September 19, 1890, in providing for this improvement, contains a requirement that the money appropriated should be spent in equal portions in the North and South forks. In accordance therewith work under this appropriation was commenced near Orangeburg, on the North Fork, and at New Bridge, on the South Fork, and no work was done on the main river below the "forks." The original project did not provide for any work on the North Fork of the

Edisto River, and, therefore, the $2,500 provided for such work shoul not be charged against the original estimated cost of this improvement

The North Fork was roughly cleared for raft navigation for width o 60 feet and depth of 18 inches at low water between Orangeburg Bridg and 8 miles below. Dividing the total expenditures to June 30, 189 for all purposes by the above number of obstructions removed show the average cost to have been 77 cents for each obstruction.

WORK OF PAST YEAR.

The whole length of river covered by the project was worked ove during the year and is now in thoroughly good condition for raft navi gation. Practically the whole estimated cost has been expended an the desired improvement has been very satisfactorily attained.

Infractions of section 6, river and harbor act, September 19, 189 and of section 3, river and harbor act of July 13, 1892, were report to the United States district attorney. His letter reporting action hereto appended.

The average cost of removing obstructions was about 57 cents eac

For details of work done and commercial statistics reference is ma to the report of my assistant engineer, Mr. James P. Allen, who h shown his usual zeal and ability.

REMARKS.

The act of July 13, 1892, completes the estimated cost of this impro ment, and the project has been satisfactorily completed, and in additi the North Fork has been cleared up to Orangeburg. To maintain t improvement small appropriations at intervals will be needed. funds are needed for next year.

No new transportation lines have been established on this river du ing the year. The balance of $449.15 on hand July 1, 1893, will be he in hand for maintenance.

During the year the freight passing over this stream has aggregat 129,125 tons.

This river is tributary to the collection district of Charleston, S. C. Charlest on the north and Beaufort on the south are the nearest ports of entry. Duties imports collected in the calendar year 1892 at the custom-house at Charlest $15,494.24 ; at Beaufort, $0.00.

For this improvement the following appropriations have been mad

By act of Congress—	
Passed August 2, 1882	$8,
Approved July 5, 1884	5,
Approved August 5, 1886	3,
Of August 11, 1888	5,
Approved September 19, 1890	5,
Approved July 13, 1892	7,
Total	33,

Total expenditures, including June 30, 1893, $32,935.85.

For table of commercial statistics furnished by the collector of Charl ton, S. C., see this year's annual report for Charleston Harbor. F table of commercial statistics furnished by the collector of Beauf S. C., see this year's annual report for Salkahatchie River.

Money statement.

July 1, 1892, balance unexpended	$172.26
Amount appropriated by act approved July 13, 1892	7,385.00
	7,557.26
June 30, 1893, amount expended during fiscal year	7,108.11
July 1, 1893, balance unexpended	449.15

REPORT OF MR. JAMES P. ALLEN, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Charleston, S. C., June 30, 1893.

CAPTAIN: I have the honor to submit the following annual report for Edisto River, South Carolina.

No work was done until October, 1892, with the funds appropriated by act approved July 13, 1892, in order to avoid the season when fevers are prevalent, and also to secure the lower stages of the river. The previous work on this river had all been done without the aid of hoisters and the men lived in encampment upon the banks. It was thought that it would prove more economical to build two hoisters and two other scows, one of each to be used by the two working parties. Preparations were made for building these in October, 1892, and they were completed in November. They were built by Mr. J. D. Ackerman, one of our overseers, near the highest point upstream of the stretch of river which it was proposed to go over. Each of the hoisters had a simple "A" frame and winch for heavy lifting in channel work, with a shelter for some of the men, while the other scows were adapted to lighter work in the channel and for the banks, with a shelter sufficient for the balance of the working party.

The stretch to be worked over was divided between two working parties, one to clear from Guignard Landing to the South Carolina Railway Bridge, and the other from this bridge to Jacksonboro. Most of this had been worked over. A stretch of about 30 miles from Guignard Landing to Holmans Bridge had never been cleared. This was inspected by me in company with yourself in November, 1892. It proved to be very narrow, badly obstructed, and in it there were several sucks which it was necessary to open. The upper party was in charge of Mr. B. G. Willis and the lower of Mr. J. D. Ackerman. Mr. Ackerman dropped his scows down the river to his place of beginning (the South Carolina Railway Bridge). Mr. Willis began near where his were built. Mr. Ackerman was directed in passing the mouth of the North Fork to do sufficient work in this fork to exhaust a small balance of the appropriation made in 1890. He cut 54 trees and 8½ cords of brush from the banks and removed from the channel 31 logs, 9 stumps, 17 large snags, and 1¼ cords of small snags, covering 1 mile of this North Fork and cutting to a depth of 18 inches and width of 60 feet. The total number of obstructions removed was 121 and the cost about 60 cents each.

The work this season has extended over nearly the whole of the portion of river under improvement, equivalent to about 210 miles by the distances given in the official examination. Three thousand and forty-eight trees and 699 cords of brush were cut from the banks, and 2,759 logs, 1,483 stumps, 3,754 large snags, and 301 cords of small snags were removed from the channel, giving a width of from 40 feet to 100 feet and depth of 18 inches at low water. Also 6 sunken rafts were removed and 11 piles were cut at the South Carolina Railway Bridge, making the total number of obstructions removed 12,061. The average cost of removing these was about 57 cents. In this is included the total cost of the hoisters and scows, which will be serviceable for some years should any further work be done on this river. Allowing about one-half of the cost of these hoisters for deterioration, and calculating the total cost per obstruction, I find it to be about 55 cents. This is nearly the same as was reported for the South Fork last year. The cost then reported for the North Fork was only 38 cents, but on that stream the work was largely bank work, which is cheaper. As a test of economy of the hoisters the above figures are not conclusive, for the eight-hour law increased the cost of the work during the last fiscal year. In my opinion this increase would amount to about 15 per cent. Making an allowance for this and the cost for 1893 reduces to about 48 cents per obstruction. This indicates a saving for the year's work of about $800, while the total cost of the hoisters and scows was a little over $600.

About three-tenths of the amount expended was for work upon the banks and about seven-tenths for work in the channel.

Seven sucks have been opened, 1 suck closed, 1 outlet closed, 1 cut closed, 1 poin cut off, and 1 small island removed. These items of work are largely covered into th cost already computed. The 7 sucks were opened at an actual cost, varying from le than $10 to about $105. This last was for railroad suck, which was the only one opene on the lower part of the river. The suck closed was the Timber Lake suck, whic is very troublesome. The banks for considerable distances are low. It is doubtf whether the closures will be sufficient or permanent. Near the lower part of the Tim ber Lake there is a sand bar, which has its origin from the loss of water carried roun by the suck. The closures made may have a beneficial effect upon this bar. Th cost of the closures is about $75. The other sucks opened and outlets closed are com paratively small. The island removed was very small and was blown out with dyn mite at a cost of less than $10.

Dynamite was more freely used than heretofore and, it is believed, with a decidedl economical effect. Some of the work was very heavy, and, especially in the low river, some work was done which could not have been done by methods previous in use.

The river is now in good condition and the original project can be fairly consi ered as completed.

No new transportation lines have been established on this river during the fisc year. No new bridges have been built. Commercial statistics have been prepar by Mr. J. D. Ackerman as in previous years.

Attention has been called repeatedly by our overseer, Mr. Willis, to the fact th certain persons had cut cypress trees in to the river and left the tops in the channel the detriment of navigation. I inspected the portion of the stream where this h been done (from the new bridge near Bamberg to the South Carolina Railroad Brid) in company with Mr. Willis in April, 1893. The obstructions resulting from th work were serious, and the cost of operations on this part of the river was consid ably increased on account of the necessity for removing these tops. The cypre trees had been thrown into the river, the logs cut out and floated down to a shing mill on the bank a few miles below the above-mentioned bridge, and the tops le where they fell. At my request Mr. Willis, in working over this section, count the trees thrown in by these men and interfering with navigation. He found eight- one. I also noted on this part of the river some old bridge timbers, which had prob been thrown in and which it would be necessary for us to remove. Furthermore, sm openings had been made for fishing purposes at the narrowest part of a number bends, which seem to me calculated to hasten the formation of sucks. All of th matters were reported to you as apparently violations of section 6 river and har act of 1890, and section 3 river and harbor act of 1892.

Mr. J. D. Ackerman and Mr. B. G. Willis, overseers, have both discharged th duties faithfully.

Very respectfully, your obedient servant,

JAMES P. ALLEN,
Assistant Engine

Capt. FREDERIC V. ABBOT,
Corps of Engineers, U. S. A.

COMMERCIAL STATISTICS.

COTTAGEVILLE, S. C., *June 4, 189*

I beg herewith to send you a report of the commerce passing over the Ed River, 1892:

Articles.	1887.		1888.		1889.	
	Quanlity.	Value.	Quantity.	Value.	Quantity.	Valu
Sawed lumber ...feet B. M..	30,000,000	$240,000.00	32,000,000	$256,000.00	32,500,000	$260.
Hewn timber ....feet..	15,000,000	90,000.00	15,000,000	90,000.00	18,000,000	126.
Round timber ..linear feet..	1,500,000	75,000.00	2,000,000	100,000.00	1,500.000	75.
Cross-ties ....feet..	38,000	3.500.00	60,000	4,800.00	2,000,000	160.
Rice ....bushels..	124,982	149,970.40	130,114	156,136.68	128,340	154.
Naval stores.......barrels..	....	....	....	....	....	....
Wood....................	....	....	....	....	....	....
Phosphate............tons..	....	....	....	....	....	....
Miscellaneous, cord wood, etc..................	....	10,000.00	....	8,000.00	....	6,
Total	....	568,478.40	....	614,936.68	....	781,

Articles.	1890.		1891.		1892.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Sawed lumber...feet B. M..	35,000,000	$280,000.00	37,000,000	$296,000.00	35,500,000	$284,000.00
Hewn timber..........feet..	17,000,000	102,000.00	12,000,000	72,000.00	11,000,000	66,000.00
Round timber ..linear feet..	1,500,000	75,000.00	1,500,000	75,000.00	1,200,000	60,000.00
Cross-ties.............feet..	2,500,000	200,000.00	2,000,000	160,000.00	1,200,000	96,000.00
Rice.................bushels..	128,796	154,555.20	130,760	156,912.00	135,850	135,850.00
Naval stores.......barrels..	900	3,600.00	6,200	4,800.00	800	3,200.00
Wood........................	....	....	....	7,000.00	....	8,000.00
Phosphate............tons..	....	....	25,000	125,000.00	25,000	125,000.00
Miscellaneous, cord wood, etc........................	....	8,000.00	....	....	....	....
Total	....	823,155.20	....	896,712.00	....	778,050.00

Tonnage for the year 1892, 129,125 tons.
Respectfully submitted.

J. D. Ackerman.

Mr. James P. Allen,
Assistant Engineer.

STATEMENT OF UNITED STATES ATTORNEY.

Office of United States Attorney,
District of South Carolina,
Charleston, S. C., June 20, 1893.

Sir: In compliance with your request of recent date I beg to give you the status of the proceedings taken by me in relation to certain violations of the act of Congress of September 19, 1890, and July 13, 1892, in respect to the obstruction of navigation in streams under the control of the United States.

First, in relation to the reported violations on the Pedee River. These violations were reported to me by you in March last, and I have ever since been in communication with various parties attempting to secure sufficient information upon which a prosecution could be based. After repeated trials and consequent delays I succeeded in obtaining sufficient information to base the issuance of a warrant upon against Charles Marthinson and G. W. Hopkins for violation of section 6 of the act of September 19, 1890. This warrant has been been placed in the hands of the United States marshal for service and arrest of the parties charged and they are to be brought before United States Commissioner C. P. Quattlebaum, at Conway, and if sufficient evidence is obtainable from the witnesses whom I have had summoned to be present at the examination before the commissioner, the case will be presented to the first grand jury after the hearing before the commissioner. This as you may know is the usual method of procedure.

In reference to the Edisto River I beg to refer you to my previous correspondence in relation to that matter and to your authorization for the employment of a detective who would obtain, or at least make the effort to obtain, information upon which a prosecution could be based against the parties violating the law in this river. I have employed in pursuance to that letter T. H. Hayne, an intelligent and efficient party, who is now at work under my directions seeking to obtain the necessary information. It is impossible at this time to state the likelihood of success in this matter, but every effort is being made, and will be made, to apprehend and bring to account the parties who have violated the law.

Very respectfully,

Abial Lathrop,
United States Attorney.

Capt. Frederic V. Abbot,
Corps of Engineers, U. S. A.

M 14.

IMPROVEMENT OF SALKAHATCHIE RIVER, SOUTH CAROLINA.

REFERENCE TO PAST REPORTS.

For preliminary examination, see p. 1144, Annual Report for 1881.

ORIGINAL CONDITION.

The river was choked with logs and snags, and in some places was divided into small branches by numerous low-lying islands.

PLAN OF IMPROVEMENT.

The project provides for clearing the channel for rafts and flatboats from a point 5 miles above Toby Bluff to Hickory Hill, 46 miles above the river mouth, a total length of 77 miles, at an estimated cost of $18,000.

WORK PRIOR TO JUNE 30, 1892.

The river had been snagged between points 46 miles and 123 miles above the mouth, 12,800 logs, snags, overhanging trees, etc., having been removed from the channel and banks. Over 181 outlets into the swamp were closed; a dam was built to remove a local shoal; one natural cut-off was widened and made the main channel of the river, and one bad cut-off was closed. Dividing the total expenditures to June 30, 1892, by the above number of obstructions removed, shows the average cost to have been $1.04 for each obstruction removed and outlet closed. The latter really cost more and the snags less, but the reports do not afford data to proportion the expenses.

WORK OF PAST YEAR.

An examination of the river was made by myself in February, 1893, which showed the necessity of some work. A party was organized and worked rapidly over the whole length of river under improvement at a cost of about $750. This put the river again into good condition.

REMARKS.

No new transportation lines have been established on the river during the year. With the balance of $3,758.34 on hand July 1, 1893, the river will be maintained in fair rafting order.

The appropriation of September 19, 1890, completed the estimated cost for this improvement. A considerable balance is held in hand to maintain the river in a navigable condition in the future. During the year the freights passing over this stream have aggregated 16,000 tons.

This river is tributary to the collection district of Charleston, S. C. Beaufort is the nearest port of entry. Duties on imports collected at the custom-house at Beaufort, S. C., in 1892, $0.00.

For this improvement the following appropriations have been made:

By act of Congress passed August 2, 1882	$5,000
Approved July 5, 1884	2,000
Approved August 5, 1886	2,000
Of August 11, 1888	3,000
Approved September 19, 1890	5,000
Total	18,000

Total expenditures, including June 30, 1893, $14,241.66.

Money statement.

uly 1, 1892, balance unexpended	$4,517.07
une 30, 1893, amount expended during fiscal year	758.73
uly 1, 1893, balance unexpended	3,758.34

REPORT OF MR. JAMES P. ALLEN, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Charleston, S. C., June 30, 1893.

CAPTAIN: I have the honor to submit the following annual report for Salka-tchie River, South Carolina:

No work had been done on this river since 1891. A few trees had fallen in and me complaint had been made of several obstructions in the lower part of the river. n examination extending from Toby Bluff to the Charleston and Savannah Rail-ad Bridge made by me in company with yourself in February and March, 1893, in-cated furthermore that repairs were needed on some of the closures built in former ars at the Du Bois Sand Drag. The river at the time of our examination was very gh and work was deferred until April 1, 1893.

Work was done where required from Toby Bluff to 1 mile below Rose Hill at the wer end. Eighty-four trees and 34¼ cords of brush have been cut from the banks, d 138 logs, 41 stumps, 58 large snags, and 32¼ cords of small snags have been re-oved from the channel. Seven outlet stoppages were repaired and had additional ork and 13 trees girdled. Of the sum expended one-fourth was upon the banks, d three-fourths in the channel. Each obstruction cost approximately $1.87.

There have been no transportation routes established. One new bridge is building ross this stream above Toby Bluff. Commercial statistics have been prepared by r. W. D. Niles. Mr. Niles has also been the overseer and has discharged all of his ties with his usual zeal and ability.

Very respectfully, your obedient servant,

JAMES P. ALLEN,
Assistant Engineer.

Capt. FREDERIC V. ABBOT,
Corps of Engineers, U. S. A.

COMMERCIAL STATISTICS.

DEAR SIR: I, in accordance with your request, submit the following report of mmercial statistics of the Salkahatchie River, South Carolina, for the year 1892. e data for this report I obtained from the written and verbal statements of the siness men of the river. * * *

Articles.	Quantity.	Value.
mber, sawed ... feet, b. m.	5,300,000	$53,000
nber, hewed ... do.		
ilroad cross-ties		
e ... bushels	225,000	135,000
sin ... barrels	1,000	1,500
Total		189,500

Sixteen thousand tons of freight transported to market via the Salkahatchie ver, South Carolina (the rice was transported over that part of the river known as mbahee), during the year 1892.

W. D. NILES.

Capt. F. V. ABBOT,
Corps of Engineers, U. S. A.

Arrivals and clearances of vessels and commerce at Beaufort, S. C., from January 1, 1 to December 31, 1892.

ARRIVED.

Year.	Coastwise.			Foreign ports.						Total.		
				American vessels.			Foreign vessels.					
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	C
1888....	103	121,207	2,630	3	1,093	26	30	21,785	422	136	144,085	
1889....	98	128,834	2,728	2	1,461	19	58	54,464	1,006	158	230,193	
1890....	43	49,173	927	7	2,987	75	52	48,656	972	102	100,816	
1891....	37	40,145	786	3	1,567	26	22	31,503	416	62	63,215	
1892....	29	34,979	607	1	896	9	37	43,526	771	67	79,401	

CLEARED.

Year.	Coastwise.			Foreign ports.						Total.		
				American vessels.			Foreign vessels.					
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	C
1888....	57	63,287	1,566	3	1,465	33	78	85,523	1,561	138	150,275	
1889....	57	73,744	1,872	....	....	....	98	99,898	1,944	155	173,642	
1890....	12	6,436	127	1	101	14	88	94,285	1,828	101	100,822	
1891....	7	3,921	75	....	....	....	51	56,300	932	58	60,221	
1892....	7	4,268	92	....	....	....	59	72,702	1,264	66	76,970	

COMMERCE.

Year.	Value of exports.	Value of imports.	Dut
1888	$850,393.00	$65,645.36	17.
1889	1,083,085.00	24,266.00	60.
1890	1,040,197.00	41,005.00	....
1891	627,851.00	137,942.54	31.
1892	791,554.00	77,751.49	....

ROBERT SMALLS,
Collector.

M 15.

IMPROVEMENT OF BEAUFORT RIVER, SOUTH CAROLINA.

REFERENCE TO PAST REPORTS.

For preliminary examination see page 1235, Annual Report for 89

ORIGINAL CONDITION.

There was a thoroughly good 7-foot channel between the tow Beaufort and Coosaw River, except at a point called Brickyard, Coosaw mouth. The least depth here was about 4 feet at low wat and the channel when deep enough was too narrow.

PLAN OF IMPROVEMENT.

It is proposed to deepen and widen the channel by dredging suf ciently to give a continuously wide 7-foot channel at low water al way through. The estimated cost is $40,000.

WORK PRIOR TO JUNE 30, 1892.

Thirty-two thousand two hundred and sixty-six cubic yards had be dredged. Dividing the total expenditures for all purposes to June

2, by the above number of cubic yards dredged, shows the average t to have been 30 cents per cubic yard. All work was done by tract.

WORK OF PAST YEAR.

7-foot channel all the way through has been secured. When it s supposed that the work was very nearly completed, a large quan- of rock mostly covered with a thin layer of sand was encountered. ile some rock was anticipated, and a price was contained in the tract for rock, the quantity was so large and the price so high that y a 50-foot cut could be completed at this point. This requires widen- as it is in a broad reach without good facilities for ranges, and au- rity was asked and obtained from the Chief of Engineers to increase estimated cost by $15,000. The correspondence is appended. The rk is essential to derive full benefit from previous work. For details work done and commercial statistics reference is made to the report ny assistant engineer, Mr. James P. Allen, who has shown his usual l and ability.

REMARKS.

o new transportation lines have been established on this river during year.

he balance of $62.77 on hand July 1, 1893, will be retained until ther funds are provided by Congress.

uring the year the freight passed over this stream has aggregated ut 250,000 tons.

his river is in the collection district of Beaufort, S. C. Beaufort is its port of y. Amount of duties collected in the calendar year of 1892, $0.00.

or this improvement the following appropriations have been made:

ct of Congress—	
Approved September 19, 1890	$12,500
Approved July 13, 1892	12,500
Total	25,000

otal expenditures, including June 30, 1893, $24,937.23.

or table of commercial statistics, furnished by the collector of Beau- , S. C., see this year's annual report for Salkahatchie River, South olina.

Money statement.

1, 1892, balance unexpended	$2,915.05
ount appropriated by act approved July 13, 1892	12,500.00
	15,415.05
30, 1893, amount expended during fiscal year	15,352.28
1, 1893, balance unexpended	62.77
1, 1893, outstanding liabilities	37.70
1, 1893, balance available	25.07
mount (estimated) required for completion of existing project	15,000.00
mount that can be profitably expended in fiscal year ending June 30, 1895	15,000.00

bmitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for dredging in Brickyard Creek, South Carolina, received a opened at 12 o'clock noon of September 9, 1892, by Frederic V. Abbot, Captain, Co of Engineers.

No.	Name of bidder.	Price per cubic yard.				Tota
		Towed less than 1 mile—30,000 cubic yards.	Towed more than 1 and less than 2 miles—35,000 cubic yards.	Towed more than 2 and less than 3 miles—10,000 cubic yards.	Rock dredged and dumped.	
		Cents.	*Cents.*	*Cents.*		
1	Savannah Dredging Co	32	34	36	$4.25	$2
2	P. Sanford Ross	30	32	34	*3.70	2
2	.... do	25	27	29	2.95	19

* These prices, if paragraph 36, Nos. 1 and 2, of the specifications does apply.

Contract (dated September 30, 1892) awarded to P. Sanford Ross.

REPORT OF MR. JAMES P. ALLEN, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Charleston, S. C., June 30, 1

CAPTAIN: I have the honor to submit the following annual report for Bea
River, South Carolina:

The contract for dredging, with funds supplied by act approved July 13, 189
awarded to Mr. P. Sanford Ross, of Jersey City, N. J., who began work at the
in the Coosaw mouth of Brickyard Creek, October 29, 1892. Rock was encou
at the outset, and work was discontinued here after taking out 255 yards.
dredge was then placed upon Range No. 1, agreeably to the request of the cont
who stated that the machine which he was then using at Brickyard was not a
to rock dredging. The work on Range No. 1 was designed to widen the chann
tained under the previous contract. It began November 1, 1892, and 6,55
yards were taken out. The widening was accomplished by dredging on both
of the channel. The width of the completed channel was 200 feet with at
feet at low water. The longest cut on this range has a length of 1,300 feet.

After the completion of work on Range No. 1 the dredge was removed to Ran
2½, so numbered because it is intermediate between Ranges No. 2 and No. 3 of
work. The turn from Range No. 2 to Range No. 3 is sharp. It was thought
make it easier and at the same time secure greater width. No. 2½ was conse
so located as to compass these ends. Work was begun here November 15 an
cubic yards taken out. The resulting channel should be at least 200 feet w
practically 7 feet deep at low water. The greatest length of cut on this ran
600 feet. The balance of the inside dredging was done on Ranges No. 3 and
which are continuous, the angle between them being slight. The work was
ing an already existing channel. Range No. 3 had been partially dredged un
last contract. The resulting channel should be, except for a short distance,
200 feet wide and 7 feet deep at low water. The total length of channel wid
Ranges No. 3 and No. 4 was about 2,700 feet. The total number of cubic yards
out was 21,590.

The work inside ended January 5, 1893. The material removed was sa
mud, the latter largely preponderating. The material from Range No. 1 was d
on the north side of Coosaw River, near the place where dumping was don
the last contract, and the balance was dumped, with the exception of a fe
loads, in McCalley Creek. The total number of cubic yards removed insid
Coosaw mouth was 34,965, of which 34,837 cubic yards was towed more
and less than 2 miles and 128 cubic yards less than 1 mile. No rock was pai
this part of the work. Some was encountered, but its removal was not neces
practically the required depth could be obtained without.

Work on Coosaw Range was resumed January 6, 1893, with the same mac
had been used throughout this contract. The contractor, having concluded
would not pay to wash the rock which he expected to take out on Coosaw

sked that he might be paid upon the basis of an estimate of the ratio of rock to and, stating that he was willing to take the estimate of our inspector. This plan as tried. I inspected its operation soon after it began by your direction and reorted to you that I considered the inspector's ratio of the relative amounts of material in the measured scows fair. You also inspected the work a few days later. he rock taken out was partly phosphate and partly a soft sandstone. The ratio f rock to sand in this place proved to be so much greater than had been anticipated hat we were able to get but two cuts through the shoal. They give a narrow chanel about 55 feet wide and 550 feet long with 7 feet at low water. There were taken t 1,339 cubic yards of rock and 1,397 cubic yards of other material. All of this as dumped on the north side of Coosaw River, the tow being less than 1 mile.

The total number of cubic yards for the whole work was as follows, separated with eference to the length of tow:

ubic yards of sand and mud towed less than 1 mile	1,525
ubic yards of sand and mud towed more than 1 and less than 2 miles	34,837
ubic yards of rock towed less than 1 mile	1,339
ubic yards removed under the contract	37,701

Some complaint was made by officers of the Coosaw Phosphate Company about he dumping ground on the north side of Coosaw River. It was so situated that hey feared dredgings there deposited would fill the high-water channel used by hem in getting to their works. A careful examination was made, as the result of f which it did not appear that any serious injury was likely to occur to this channel, nd there was no other place available for dumping in Coosaw River. All reasonble concessions were made to prevent trouble, while at the same time giving the nited States the advantage of a shorter tow.

In removing the rock on the Coosaw Range, which came out in very large pieces, ridge was unavoidably left by the dredge on the south side of the cut. This conisted of large pieces of rock and was dangerous to navigation, especially as the hannel was narrow. The phosphate dredges working at this place also turned up me pieces of sand rock on the north side of the cut.

An effort was made, first in March and afterward in June, 1893, to remove this ridge f rock thrown up by the dredge on the south side. The plan was to anchor a small ghter over the spot, get hold of the pieces in some way from this lighter, or by havng men go overboard, and turn them over into the dredged cut, where the depth is ore than is needed. In March the water was so cold that the men could not go overoard. The work was deferred until summer. In June the effort was renewed, with ndifferent success. It was found that many pieces had been lifted only partially by e dredge and still retained their hold to the bottom. The means and appliances use were inadequate to their removal and the appropriation was too nearly exausted to warrant trying with a more suitable plant. The work was accordingly scontinued. Some pieces were thrown over into the deep cut.

As the result of work done at the Brickyard on Beaufort River I consider there is w a fairly good 7-foot channel, except over the Coosaw shoal from Coosaw River to rt Royal Sound. There are two or three places where this channel may be advangeously widened, but the widening of the Coosaw channel is the most urgent need this improvement at present. This is true, not only because the cut is narrow, t also because its sides are of rock and undoubtedly rough.

No surveys have been made here this year, except such soundings as have been ken by the inspector to show that the required depth was obtained and not too eatly exceeded.

There have been no new transportation lines established on this river. No bridges ve been built across it.

Mr. W. D. Niles has done all of the inspecting. He has been faithful and judicious the discharge of his duties. Herewith is submitted a table of commercial statiss prepared by Mr. Niles.

Very respectfully, your obedient servant,

James P. Allen,
Assistant Engineer.

Capt. Frederic V. Abbot,
Corps of Engineers, U. S. A.

COMMERCIAL STATISTICS.

Commerce in 1891.

Articles.	1891.	
	Quantity.	Value.
Lumber, timber, railroad ties .... feet..	4,120,000	$37, 5
Shingles .... number..	100,000	5
Wood .... cords..	600	1, 8
Coal .... tons..	7,300	29, 0
Phosphate, rock .... do...	173,000	830, 0
General merchandise, machinery, hardware, etc .... do...	9,150	300, 0
Lint cotton, seed cotton .... do...	1,600	140, 0
Rough rice .... do...	1,000	58, 0
Total	....	1, 378, 8

Aggregate tons of freight transported through Brickyard Creek during the ye was 202,235 tons.

Aggregate tonnage, value, and number of trips of vessels passing through that part Beaufort River, South Carolina, known as Brickyard Creek during the year 1891.

No.	Class.	Aggregate tonnage.	Aggregate value.	Aggregate nu ber trip
3	Passenger boats	900	$40,000	0
16	Tugboats	1,000	170,000	1, 0
37	Dredges, wash boats, lighters	6,000	280,000	5, 0
20	Coastwise vessels	10,000	500,000	0
	Steam pleasure yacht	250	203,000	5
30	Small boats from 2 to 50 tons	400	12,000	0
3	Pilot boats	100	10,000	5
2	Revenue cutter	1,100	180,000	0
1	Buoy tender			
1	Fish Commission boat			
	Total	19,750	1,875,000	7, 0

Five thousand passengers passed over the creek during the year.

STATEMENT OF MR. W. D. NILES.

SIR: In accordance with your request, I submit the following report of commer statistics for the year 1892 of that part of Beaufort River, South Carolina, kno as Brickyard Creek. The data for this report I obtained from the written and v bal statements of the business men of the river.

Articles.	Quantity.	Valu
Phosphate, rock .... tons..	200,000	$[illegible]
General merchandise, machinery, hardware, etc .... do...	10,000	30
Lint cotton, seed cotton, cotton seed .... do...	11,000	20
Rough rice .... do...	1,000	1
Coal .... do...	10,000	[illegible]
Lumber, timber, railroad ties .... feet B. M..	5,120,000	51
Shingles .... number..	100,000	
Wood .... cords..	1,000	1
Total .... tons..	250,000	1, 545

Aggregate tonnage, value, and number of trips of vessels passing through that part of Beaufort River, South Carolina, known as Brickyard Creek during the year 1892.

No.	Class.	Aggregate tonnage.	Aggregate value.	Aggregate number trips.
3	Passenger boats	900	$40,000	225
16	Tugboats	1,100	180,000	1,550
37	Dredges, wash boats, lighters	6,000	280,000	5,500
30	Coastwise vessels	10,000	500,000	20
10	Steam pleasure yachts	300	200,000	30
30	Small boats from 2 to 50 tons	400	1,200	500
3	Pilot boats	100	10,000	75
2	Revenue cutters	700	175,000	50
1	Buoy boat			
	Total	19,500	1,386,200	7,950

Six thousand passengers passed over the creek during the year.

W. D. NILES.

Capt. F. V. ABBOT,
Corps of Engineers, U. S. A.

LETTER OF CAPT. FREDERIC V. ABBOT, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Charleston, S. C., April 12, 1893.

GENERAL: I have the honor to say that in completing the work in Beaufort River at a point known as Brickyard Creek, we encountered a much larger proportion of rock than I had anticipated from my surveys. This rock, being buried under sand and occurring at a higher level than it was found at any other point where we dredged, escaped consideration in the estimate. We succeeded in getting a narrow cut all the way through, but it is too narrow for practical use, being only about 50 feet wide. It is at a point where the river is wide and there are no available sites on shore for range marks. The channel as now cut is dangerous, as vessels are tempted to use the increased depth afforded by our dredging, and when they strike the edge of the cut they are liable to injure themselves against the ragged projecting rocks which are left along the sides. I think it urgently necessary that the estimate for this work be increased $15,000. This will enable us to greatly improve what we have already done and will add greatly to the effectiveness of our previous work. I ask authority to so report in my next annual report.

Very respectfully, your obedient servant,

FREDERIC V. ABBOT,
Captain of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

LETTER OF THE CHIEF OF ENGINEERS.

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., April 15, 1893.

CAPTAIN: Your letter of the 12th instant, stating necessity for increasing estimate for completion of work in Beaufort River at a point known as Brickyard Creek, is received.

You are authorized, for reasons stated, to increase the estimate of amount required for completion of project for this work by the amount named ($15,000), the reasons for this increase, with full reasons as to its necessity, to be stated in the text of your next annual report.

By command of Brig. Gen. Casey.

Very respectfully, your obedient servant,

H. M. ADAMS,
Major, Corps of Engineers.

Capt. F. V. ABBOT,
Corps of Engineers.

M 16.

REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGERING NAVIGATION.

In my last Annual Report two wrecks in Quinby Creek and one in the Eastern Branch of the Cooper River were reported as plainly under the provisions of the law providing for the removal of dangerous wrecks.

Funds were allotted for their removal by the Secretary of War on July 14, 1892. On August 9 they were advertised for removal; bids were opened on Septemher 9, eight bids being received. The lowest bid was informal, the bondsmen not having signed their bond. The award was recommended to the next higher bidder. This was not approved, and I was ordered to submit the bonds for signature, and in case they were signed to accept the lowest bid—that of Mr. Charles J. Relyea. for $350. The bondsmen refused to sign, and the award was then approved to Mr. Hasell W. Crouch, the next to the lowest bidder at the original opening. His bid was $775. As the original allotment was only $750, a further allotment of $100 was asked and made by the Secretary of War, under date of September 3. The contract was let on 20th of September and the work was completed by Mr. Crouch in November, 1892. The tugboat *B. F. Huger*, in the Eastern Branch, was entirely removed and placed on the marsh far enough back to be safe from coming in again. The schooner in Quinby Creek was moved to a point on the marsh on the north side of Quinby Creek and a pile was driven through her bottom to keep her from coming into the river again. The sloop was completely broken up and the pieces were piled above high water on the Quinby Landing side. Nothing of value was found in the hulls or cargoes of these wrecks.

WRECK IN BEAUFORT RIVER, SOUTH CAROLINA.

On July 6, 1892, I received a letter from Mr. M. E. Lopez, of the same date, reporting a wreck in Beaufort River, at a point near the wharves of the Sea Island Chemical Company. This wreck was examined by myself in August, 1892. It was found that the tug *Reliance*, belonging to the Sea Island Chemical Company, picked up an abandoned vessel loaded with lumber off Port Royal Bar some time in 1884. She towed it up Beaufort River, ran it aground some distance further up than its present location, and, as no owner could be found, the wreck and cargo were sold in due process of law, and were purchased by Mr. D. C. Wilson, of the Chemical Works. The cargo was removed and the hull was sold to a man by the name of J. A. Torrent, who in turn sold it to Mr.

E. E. Groom, who broke up as much of the wreck as he conveniently could for the copper fastenings, after which he abandoned it. It has gradually moved downstream and out from the bank into its present position, where it has remained a long time without further motion. It only interferes with the business of the same party who brought it in from the ocean and afterwards removed everything of value from it. I recommended, under the circumstances, that the wreck be buoyed, but stated that I had no funds to do it with. I was ordered to apply to the Light-House Board with request that they buoy the wreck. This request they declined to comply with, so that the wreck now remains exactly as it was. While it is outside of the dock lines, in water about 14 feet deep, it is entirely out of the way of through traffic, and is only an inconvenience to the tugboats belonging to the Sea Island Chemical Company, all of which know its position and can keep off of it.

WRECK OF SLOOP ELLA IN ASHLEY RIVER.

On January 24, 1893, I received a letter of that date from Mr. C. S. Gadsden, of this city, informing me that the above-mentioned vessel, with a cargo of 16 tons of fertilizer, struck the North Pier of the Ashley River draw in the Charleston and Savannah Railroad Bridge, across that stream, and sunk there. I informed him that if the United States removed her the vessel and cargo would be confiscated, and as a result he removed the vessel himself.

WRECK OF SCHOONER KATE V. AITKEN IN SWASH CHANNEL, CHARLESTON HARBOR, SOUTH CAROLINA.

On March 9, 1893, this schooner got out of the channel some 800 feet, and was wrecked about 500 or 600 feet outside of the outer end of the north jetty. She shifted her position subsequently, drifting nearer the channel. On March 18 I reported that she was endangering the channel, and asked an allotment of $5,000 for her removal. She was advertised April 15; bids were opened on May 15; award was made to Messrs. Charles W. Johnston and Enoch Townsend, the lowest bidders, and contract was entered into with them on the 23d of May to remove her for the sum of $4,745, the amount of their bid. Work had not begun at the close of the fiscal year.

Money statement.

July 1, 1892, balance unexpended		$73.44
Amounts alloted under act June 14, 1880:		
July 15, 1892, Cooper River wrecks	$750.00	
July 22, 1892, Beaufort River wreck	70.00	
September 23, 1892, Cooper River wrecks	100.00	
March 22, 1893, wreck schooner *Kate V. Aitken*, Charleston Bar	5,000.00	
		5,920.00
		5,993.44
June 30, 1893, amount expended during fiscal year	1,029.41	
December 10, 1892, amount turned into Treasury of the United States	69.70	
		1,099,11
July 1, 1893, balance unexpended		4,894.33
July 1, 1893, amount covered by uncompleted contract		4,745.00
Balance available		149.33

Abstract of proposals for removing wrecks in Quinby Creek and Cooper River, South Carolina, received and opened at 12 o'clock noon of September 9, 1892, by Frederic V. Abbot, Captain, Corps of Engineers.

No.	Name of bidder.	Price.
1	Enoch Townsend	$1,565
2	Louis H. Skinner	1,175
3	Charles W. Johnston	835
4	P. Sanford Ross	2,500
5	Hasell W. Crouch	775
6	Charles J. Relyea*	350
7	John G. Smith	1,640
8	C. O. Campbell	2,473

* Bid informal, guarantee being unsigned.

Contract (dated September 20, 1892) awarded to Hasell W. Crouch.

Abstract of proposals for removal of wreck of schooner Kate V. Aitken in Swash Channel Charleston Harbor, received and opened at 12 o'clock noon of May 15, 1893, by Frederic V. Abbot, Captain, Corps of Engineers.

No.	Name of bidder.	Price.
1	George W. Egan and Jacob Friday	$6,440
2	K. S. Tupper and J. G. Smith	8,440
3	C. W. Johnston and E. Townsend	4,745

Contract (dated May 23, 1893) awarded to Charles W. Johnston and Enoch Townsend.

M 17.

PRELIMINARY EXAMINATION OF LYNCH RIVER, SOUTH CAROLINA.

[Printed in House Ex. Doc. No. 125, Fifty-second Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 12, 1892.

SIR: I have the honor to submit the accompanying copy of report dated December 2, 1892, by Capt. F. V. Abbot, Corps of Engineers, giving the results of a preliminary examination of Lynch River, South Carolina, authorized by the river and harbor act approved July 13, 1892.

Captain Abbot states that in his opinion Lynch River is worthy of improvement from Effingham, S. C., to deep water in Clark River for steamers, and above Effingham for a distance of about 50 miles for rafts and flatboats.

For the reasons mentioned by the local engineer, Col. Wm. P. Craighill, Corps of Engineers, the division engineer, concurs in the opinion that this river is worthy of improvement by the General Government to the extent indicated in this report, and this opinion is also concurred in by this office.

Captain Abbot estimates that a sufficiently close and accurate survey to cover the necessities of the case can be made for $600.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

HON. S. B. ELKINS,
Secretary of War.

REPORT OF CAPT. FREDERIC V. ABBOT, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Charleston, S. C., December 2, 1892.

GENERAL: I have the honor to submit the following report of a personal examination of Lynch River, South Carolina, which I made on November 24 and 25, 1892, when the river was only about 1 foot above dead low water.

In my opinion this stream is worthy of improvement from Effingham, S. C., to deep water in Clark River for steamers, and above Effingham for a distance of about 50 miles for rafts and flatboats.

On the part of the river above Effingham timber rafts are now run, and a small sum judiciously spent here will greatly facilitate this traffic. For about 65 miles below Effingham the river is, with few exceptions, in fair condition for use by such steamers as now run on the Upper Waccamaw, on the Little Pedee, on the Wateree, and on the Congaree rivers. For a comparatively small expenditure this 65 miles could be put into excellent condition. From 65 to 73 miles below Effingham the river wanders through a cypress swamp, with three connections with Clark River besides its own mouth in Great Pedee River.

There appears to be depth enough in this part of the river itself and through the lakes connecting it with Clark River to give a good steamboat route from the good portion of Lynch River to the good portion of Clark River. By one of these connections it is almost certain that a good outlet into the Great Pedee can be secured. The Pedee mouth of Lynch River itself can not be satisfactorily improved. To wisely choose the best of the three different available routes and estimate the cost of the work a survey is absolutely necessary.

Lynch River flows through a fertile, well-cultivated section of country, which is almost entirely without railroad facilities below Effingham. There are twenty-two landings on the right bank and twenty-two landings on the left bank of this part of the river, which gives on each side an average of one landing to each 3 miles, making this river much more accessible to the land along its banks than the majority of rivers in this State. The people all along the river are anxious to have it opened for steamers.

At the time of my examination there were rafts aggregating about 1,000 logs of fine pine timber and 1,500 cross-ties waiting for a freshet to pass out of the river and into Clark River over a log jam in the extreme lower end of the river. I am told that there is a very considerable traffic now carried down the river by rafts, but I was unable to get any reliable figures as to its amount. Judging by results actually obtained on somewhat similar rivers by work which I have done in the last four or five years, I think that an annual shipment of at least $50,000 would quickly spring up if this river were improved and that the business would keep on increasing. The lower part of the river swamp contains immense quantities of most valuable cypress, and as soon as the mouth is opened the whole will become available for market. A large cypress-cutting sawmill on Great Pedee River, only 8 miles below the mouth of Lynch River, will afford a ready market for this timber, as it has nearly exhausted the cypress in the Great Pedee swamps, which (the cypress) lies near enough to be conveniently reached.

The river is crossed by three wooden bridges. They could be cheaply provided with draw spans, as they are already built with wide raft spans.

This river was examined January 15, 1881 (see p. 1039, Annual Report Chief of Engineers for that year), by Mr. John F. Darling, assistant engineer. My own observations on this river do not agree with Mr. Darling's. Like all the rivers in this section of the State, Lynch River can not be navigated by steamers at dead low water, but gauge observations show that there is at least 2 or 3 feet rise in the river for all but a very few weeks each year, and this low period does not generally correspond with the time when river traffic would be active. There are hardly any caving banks on the river, and decidedly less snags which would require removal than on any other river of its length I have examined in the State.

I estimate that a sufficiently close and accurate survey of the lower part of this river, to cover the necessities of the case, can be made in two months' time by a party costing $300 a month. * * *

Very respectfully, your obedient servant,

FREDERIC V. ABBOT,
Captain of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. William P. Craighill, Corps of Engineers, Division Engineer, Southeast Division.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., December 7, 1892.

Respectfully submitted to the Chief of Engineers.

For the reasons mentioned by the local engineer I concur in the opinion that this river is worthy of improvement by the General Government to the extent indicated by him in his report.

WM. P. CRAIGHILL,
Colonel, Corps of Engineers.

APPENDIX N.

IMPROVEMENT OF RIVERS AND HARBORS IN EASTERN GEORGIA.

REPORT OF CAPT. O. M. CARTER, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1893, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. **Savannah Harbor, Georgia.**
2. **Savannah River, Georgia.**
3. **Savannah River above Augusta, Ga.**
4. **Darien Harbor, Georgia.**
5. **Altamaha River, Georgia.**
6. **Oconee River, Georgia.**
7. **Ocmulgee River, Georgia.**
8. **Brunswick Harbor, Georgia.**
9. **Brunswick Outer Bar, Georgia.**
10. **Jekyl Creek, Georgia.**
11. **Cumberland Sound, Georgia.**
12. **Inside water route between Savannah, Ga., and Fernandina, Fla.**
13. **Removing sunken vessels or craft obstructing or endangering navigation.**

EXAMINATION.

14. **Savannah River, Georgia, between Spirit Island and crossing of Charleston and Savannah Railway.**

HARBOR LINES.

15. **Savannah River in vicinity of quarantine station near Fort Pulaski, Savannah, Ga.**

UNITED STATES ENGINEER OFFICE,
Savannah, Ga., July 1, 1893.

GENERAL: I have the honor to transmit herewith my annual report for the fiscal year ending June 30, 1893, upon the works of river and harbor improvements then in my charge.

Very respectfully, your obedient servant,

O. M. CARTER,
Captain, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

N 1.

IMPROVEMENT OF SAVANNAH HARBOR, GEORGIA.

Operations for improving this harbor have been carried on durin the last fiscal year in accordance with a project of improvement approved by the Secretary of War July 22, 1890, and printed as part o Appendix O 1, Annual Report of the Chief of Engineers for 1890 For a special history of past work, see pp. 1012–1023, Annual Repor of the Chief of Engineers for 1888, and the annual reports of the sam officer since that date.

ORIGINAL CONDITION.

In 1873, before the work of improvement was inaugurated, the usu draft of vessels navigating the river at high water was 14.5 feet. Th mean rise and fall of the tide was about 6.5 feet at the city of Savannah, and 7 feet at the mouth of the river.

PLAN OF IMPROVEMENT.

The plan of improvement under which operations have been carri on during the last fiscal year provides for the establishment of a channel depth of 26 feet at mean high water from the city of Savannah o the sea. The mean rise and fall of tide varies from 6.97 feet at Ft Pulaski to 6.07 feet at the barge office in the city of Savannah. Te principal features of the project of improvement, which is printed as part of Appendix O 1, Annual Report of the Chief of Engineers fr 1890, are:

(1) The enlargement of Drakie Cut.

(2) The entire or partial removal of King Island.

(3) The construction of a deflecting jetty from Argyle Island.

(4) The partial removal of Marsh Island and the closing of te channel north of it.

(5) The construction of a training wall from Marsh Island to Kin Point and the enlargement of the river near there.

(6) The construction of a training wall at Garden Bank.

(7) Spur jetties or bank protection in the Wrecks Channel, and a deflecting jetty at Mackay Point.

(8) The removal of a portion of Dam No. 15.

(9) The closing of Duck Puddle.

(10) The construction of shore protection and of training wa between the wing dams in North Channel from the Upper Flats to e Oyster Bed.

(11) The construction of training walls extending eastward fro Cockspur Island and the Oyster Bed.

(12) Dredging is provided for between the Cross Tides and e Tybee Roads.

The estimated cost of this improvement is $3,500,000, provided fun are regularly and adequately supplied.

Prior to 1826 an expenditure of about $100,000, raised by a tax up shipping entering the harbor, was made under the direction of t commissioners of pilotage in clearing the river of wrecks, and in otherwise improving its condition, and between 1867 and 1871 an expenditure of $157,000 was made by the city of Savannah in dredging on t shoals between Cross Tides and the sea. From 1826, the date of t irst appropriation made by the United States for the river, up to the ate of beginning operations according to the 26-foot plan o fimprovement, appropriations aggregating $1,879,096.64 were made by Congress or the work.

SUMMARY OF OPERATIONS PRIOR TO JULY 1, 1892.

In 1872 the United States Engineer Department resumed charge of he improvement of the harbor, and from that time up to July 1, 1874 since which date operations have been carried on in accordance with he 22-foot plan of improvement described on p. 1246, Annual Report f the Chief of Engineers for 1890), there were removed from the channel 6 vessels, 16 cribs, and 1 sunken lighter, besides 166,498 cubic yards f material dredged from the wrecks, the shoals abreast of Elba Island nd at the Oyster Beds, and from Tybee Knoll.

Under the 22-foot project the following work has been accomplished:

At Cross Tides a dam has been constructed, extending from the Rice Dike on Argyle Island to that on Hutchinson Island, with the object of iverting a large volume of water at ebb tide into the Front River. his dam was originally designed to be a pile structure, and was begun n 1876. During the next year it was so much injured by a freshet hat work upon it was suspended. In December, 1878, the present dam as begun. It is composed of log and brush mattresses, and brush ascines loaded with riprap stone, and is located 273 feet above the bandoned pile structure.

As soon as the dam was brought up above the level of mean low ater considerable settlement occurred, due to scour caused by the ebbide overpour. To prevent further scour an apron of log mattresses as placed along its downstream face, and the dam was raised in 1885 ith brush fascines and stone to the level of high water by building on he upstream side of the crest, utilizing the old structure as an addional apron.

Since that time further settlement has occurred, and the work has lso been damaged by fishermen and other parties who throw large uantities of stone off the dam to open a short water route from Back iver to the city of Savannah.

About 70 linear feet of the old Kings Island Jetty, near Cross Tides, as removed in 1880–'81 to facilitate the flow of water into Front iver.

Three wing dams were constructed in 1882–'83 for the improvement f the Garden Bank Shoal in front of the city. They spring from Fig sland and contract the waterway, which was formerly from 900 to 1,050 eet in width, to about 560 feet. A short spur jetty was built in 1883 bout 800 feet above the lower end of Fig Island to regulate the ebb ow from Front River into the Wrecks Channel.

To properly confine the ebb currents in the Wrecks Channel a training wall rising to mean high water was built for a length of about 6,750 eet downstream from a point a little above the lower end of Fig Island, ith which it is connected by a return work 160 feet in length.

This training wall, begun in 1881, and extended and raised at interals since then, runs about parallel to the right bank of the river, and provided on the channel side with 11 short spurs placed at right ngles to the axis of the channel, which has a low-water width increasng from 680 feet at the upper end to 880 feet at the lower.

Two dams, numbered 5 and 11½, respectively, and designed to inease the flow of water in the main channel, were built in 1883 to close lateral channels on either side of Barnwell Island, opposite Fort Oglethorpe.

A low-sill dam, designed to increase the ebb flow in the north channel, was built in 1881 across the south channel a short distance below the head of Elba Island.

A wing dam, numbered 15, was built in 1883 for the improvement of the channel at the Obstructions. It extends eastward from Barnwell Island, No. 3, and contracts the waterway, which was formerly about 1,950 feet in width, to about 1,000 feet.

Three pairs of wing dams have been built for the improvement of the crossing at the Upper Flats. Those numbered 4 and 23, built in 1883, constitute the upper pair, and are situated at the eastern end of Spirit Island. Those numbered 6 and 25, constituting the second pair, and those numbered 10 and 27, constituting the third pair, are situated at distances below the first of about 800 and 1,600 yards, respectively.

The original low-water width of the river at this crossing varied from 2,000 to 4,000 feet. It is reduced by these dams to 1,050 feet at the upper and to 1,200 feet at the lower pair. These dams rest, with the inner ends of the respective pairs, upon opposite banks of the river with the exception of the one numbered 27, between whose inner end and the shore there is a gap of about 500 yards.

Three wing dams have been built for the improvement of the crossing at the Lower Flats. At the upper end of this crossing, dams numbered 14 and 29 were built in 1883–1885. They spring from the opposite banks of the river, and contract the waterway from over 2,400 feet to 1,250 feet. At the lower end of this crossing a partially completed dam, numbered 13, was built in 1883. It springs from islands 1 and 2, and leaves a waterway 1,250 feet in width between its outer end and the opposite shore of Jones Island.

The lateral channel at Philbricks Cut, Big Gap, and Dutch Gap are closed by dams built in 1882.

Two pairs of wing dams have been built for the improvement of the Long Island Crossing.

Dams numbered 26 and 33, constituting the upper pair, were built in 1885. They reduce the low-water width of the river from 3,100 to 1,300 feet. Dams numbered 28 and 35, constituting the lower pair, were built in 1886–'87, and reduce that width from 4,500 to 1,350 feet. The inner ends of these dams are connected with the shore, with the exception of number 35, between whose inner end and the shore of Jones Island there is a gap of 500 feet.

To prevent the diversion of the ebb flow from the main ship channel a dam numbered 31, and about 3,500 feet in length, was built in 1885, to close the old channel north of the Oyster Beds.

For the improvement of the channel across Tybee Knoll, a training wall, extending from the Oyster Beds eastward a distance of 10,031 feet, was begun in January, 1889. Two courses were completed during that fiscal year, and during next year the third course was extended 3,660.6 feet, and an additional load of riprap was placed on the entire crest.

All of the structures described are composed of log and brush mattresses, or brush fascines, or both, loaded with riprap stone. In their original construction and the repairs which it has been necessary to execute up to July 1, 1890, there have been used 438,679.49 square yards of log and brush mattresses, 165,853.28 cubic yards of brush fascines, 95,353.58 cubic yards of riprap stone, and 1,591.87 cubic yards of shells, while 973 cubic yards of stone have been removed in repairing the Fig Island training wall.

During this period the river channel was widened at the lower end of Fig Island, and more or less dredging was done upon the various shoals between Cross Tides and Tybee Knoll. Up to July 1, 1890, the total dredged material removed, consisting of sand, mud, and shells, amounted to 2,076,857.52 cubic yards.

Up to July 1, 1890, the total expenditures on Savannah Harbor by the United States since 1826, including outstanding liabilities, amounted to $1,875,219.03.

Under the present project, the following work was accomplished prior to July 1, 1892: The Oyster Bed training wall was extended 1,984.1 feet, making its total length 12,016.1 feet. In addition to the stone used in sinking the mattresses, the crest of the training wall was heavily loaded with riprap stone, being brought up to mean low water for a distance of 7,000 feet. There were used 72,178.4 square yards of log and brush mattresses and 26,844.27 cubic yards of riprap stone.

For the protection of caving banks there were built at Elba Island 17 spur dams of piles and brush, aggregating 1,248.2 feet in length, and at Jones Island 27 similar dams aggregating 2,845.8 feet in length. There were used in these dams 1,131 piles, 18,933.02 cubic yards of brush fascines, and 996.98 cubic yards of stone. In the closing dam at Duck Puddle, 532 feet in length, there were used 275 piles, 6,218.99 cubic yards of brush fascines, and 778.39 cubic yards of stone. At the ends of the Elba and Jones Island spur dams there were driven 44 clusters of fender piles.

In the southern Elba Island training wall there were used 1,273 piles, 20,116.38 cubic yards of brush, and 610.03 cubic yards of stone. In the northern Elba Island training wall there were used 594 piles, 9,526.19 cubic yards of brush, and 353.38 cubic yards of stone.

There was removed by dredging at various times from the various shoals between the Ocean Steamship Company's wharves and Tybee Knoll 432,315.16 cubic yards of material.

The total expenditures under the present project up to July 1, 1892, including all outstanding liabilities, amounted to $346,377.80.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1893.

The river and harbor act approved July 13, 1892, contained an appropriation of $318,750 for continuing this improvement, with the following provisions:

> *Provided*, That contracts may be entered into by the Secretary of War for such materials and work as may be necessary to complete the present project of improvement, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate two million eight hundred and thirty-one thousand two hundred and fifty dollars exclusive of the amount herein and heretofore appropriated.

A contract was entered into with P. Sanford Ross, of Jersey City, N. J., for all of the dredging, and with The Atlantic Contracting Company, of New York, for all of the other work required for the improvement.

Jetty work under the contract awarded October 22, 1892, to The Atlantic Contracting Company was begun October 14, 1892, and has continued to the end of the fiscal year.

There were driven in the north Elba Island training wall 2,290 piles, advancing it 9,119.8 linear feet. There were put into this training wall 51,919.90 cubic yards of fascines; 39,355.34 square yards of mattresses, which were sunk on the channel side; 2,065.89 cubic yards of stone, and 168,661.10 feet B. M. of 6 by 10 inch timber, as waling, cross and back ties, for the fastening of which 17,480.11 pounds of iron bolts were used. There were also driven 181 groups of tie piles and 1 cluster of fender piles; and in the repairing of the old work of the training wall there were used 618.36 cubic yards of fascines, and 18 piles were driven.

There were put into the south Elba Island training wall 5,526.36 cubic yards of fascines; 26,706.59 square yards of mattresses, which were sunk on the channel side; 869.86 cubic yards of riprap stone, 76,548.00 feet B. M. of 6 by 10 inch timber, as waling, cross and back ties, for the fastening of which 9,316.15 pounds of iron bolts were used. There were also driven 86 groups of tie piles and 22 piles in repairing old work.

There were put into the Lower Flats training wall 829.18 cubic yards of fascines, 174,522.02 square yards of brush mattresses and 5,082.34 cubic yards of riprap stone.

There were driven on the four new spur dams built on the north shore, below Wing Dam No. 29, 200 piles, making an aggregate length of 780 feet. There were put into these spur-dams 2,103.71 cubic yards of fascines, 8,259 feet B. M. of 6 by 10 inch timber, and 1,006.64 pounds of iron bolts. Aside from the pile work proper there were driven 1 group of tie piles and 5 clusters of fender piles, so that the entire number of piles driven was 217.

There were put into the old Elba Island and Jones Island spur dams 1,932.90 cubic yards of fascines, 125 square yards of mattresses, 37 cubic yards of stone, and 48,559.5 feet B. M. of 6 by 10 inch timber, as waling, cross and back ties, for the fastening of which 5,596.2 pounds of iron bolts were used. There was also driven 1 cluster of fender piles, and in repairing the spur dams 41 piles were driven.

There was put into the Duck Puddle closing dam 758.24 cubic yards of fascines, raising its crest to the level of mean high water.

Altogether there were, therefore, put into the various works during the year 63,688.65 cubic yards of fascines, 240,708.95 square yards of mattresses, 8,055.09 cubic yards of stone, 302,027.60 feet B. M. of 6 by 10 inch timber, 33,399.10 pounds of iron bolts, and 3,128 piles.

Dredging under a contract, awarded October 20, 1892, to P. Sanford Ross, was commenced on October 10, 1892, and continued to the end of the fiscal year. The following quantities of material were removed at various points:

(1) At the shoal opposite the Central Railroad Company's wharves, 97,541.49 cubic yards.

(2) At Garden Bank, 29,766.3 cubic yards.

(3) At the shoal opposite the Savannah, Florida and Western Railway Company's wharves, 28,163.4 cubic yards.

(4) At the obstructions near the upper mouth of the South Channel, 31,521.7 cubic yards.

(5) At the Lower Flats, 86,536.1 cubic yards.

(6) At the Oyster Bed Shoals, 51,328.3 cubic yards.

(7) On Tybee Knoll, 163,661.39 cubic yards; making in all 488,518.68 cubic yards of material removed during the year.

CONDITION OF WORK JUNE 30, 1893.

Cross Tides.—The condition of this work is about as described in former reports. The general crest is now at an average height of 1.5 feet above mean low water.

City of Savannah.—The depth of water above the Ocean Steamship Company's wharves shows no appreciable change during the year. At these wharves and below considerable dredging has been done, and the 18-foot curve now commences about 2,000 feet above the Central Railroad elevator, and continues unbroken as far down as 600 feet below the City Exchange. Thence downward the 18-foot curve is interrupted at several places, but there is a least practicable depth of 15½ feet. On Garden Bank dredging has been done, leaving a least practicable depth of 16¼ feet over this shoal. The wing dams here are in good condition.

Wrecks Channel.—Dredging has been done on the shoal at the upper end of the Fig Island training wall, opposite the Savannah, Florida and Western Railway wharves, and there is now a practicable least depth of 15.8 feet over it. No dredging has been done in any other part of Wrecks Channel, but the conditions have slightly improved, the area of the 18-foot curve having extended somewhat, as compared with the last annual report. The practicable least depth throughout Wrecks Channel is about the same now as then, viz., 16 feet.

Obstructions.—Considerable dredging has been done here and has resulted in making the 18-foot curve continuous and in giving a practicable least depth of 17½ feet over the shoal.

Upper Flats.—The wing dams and training walls built for the improvement of this crossing are in good condition, both the north and the south Elba Island training walls, as well as the Elba Island spur dams, having undergone some repairs during the year and having been strengthened by waling and cross and back ties of 6 by 10-inch timber. The north Elba Island training wall was extended easterly a distance of 9,119.8 feet to about 1,440 below Wing Dam No. 29, where it joins a spur dam built out from the shore, and forming a return. Between Wing Dams No. 4 and No. 6 there still remains a channel region with of about 16¼ feet practicable least depth; otherwise the 18-foot curve is continuous, and 17 feet can be safely carried over the crossing at mean low water. No dredging was required here.

Lower Flats.—On the north shore four new spur dams, including the one forming a return for the Elba Island training wall, have been built below Wing Dam No. 29, aggregating in length 780 feet. On the south shore a training wall about 2,450 feet long, consisting of brush mattresses and riprap stone, and built up to about 3 feet above low-water level, was constructed, from Wing Dam No. 14 to Wing Dam No. 13. Considerable dredging has been done during the year and has resulted in making the 18-foot curve continuous over this crossing.

Long Island Crossing.—The wing dams at this crossing are in good condition. The area of the 18-foot curve has perceptibly increased since the last annual report, as has also the practicable least depth over the crossing, which now is 16.2 feet as against 15.2 feet in 1892. No dredging was required here.

Oyster Beds.—Dam No. 31 is in good condition. The channel at this point has been well maintained during the year. It has been widened by dredging on the northern edge of the shoal opposite the red light on Oyster Bed Shoal.

Tybee Knoll.—The oyster bed training wall is in good condition. Considerable dredging has been done in the channel on both the Elba Island and the Jones Island range, from about Buoy No. 6 to below Buoy No. 7. There is now over this entire stretch, and out to deep water, a practicable least channel depth of 17 feet.

Shore protection.—Repairs required to be made to the Elba and Jones Island spur dams have been carried out during the year. They were also strengthened by waling, cross and back ties of 6 by 10-inch timber, and are now in good condition.

Four new spur-dams, Nos. 28, 29, 30, and 31, were built into the river from the north shore, having an aggregate length of 753.2 feet and filling the gap between Jones Island Spur Dam No. 1 and the lower end of the north Elba Island training wall.

Closing dams.—All of the closing dams upon the river, with the exception of those at Philbrick Cut and Big Gap, are in good condition. Some breaks have taken place in the closing dams at Philbrick Cut and Big Gap, which, when completed, were at the level of mean high water. A great deal of stone has been thrown off those dams by negro fishermen to open a waterway through into the South Channel, and these small gaps have rapidly enlarged under the influence of storms. All of the other closing dams are in good order, although they have settled slightly in some cases.

The crest of the Duck Puddle closing dam, which had settled somewhat, was brought up to the level of mean high water by means of brush fascines.

COMMERCE AND NAVIGATION.

A full statement and discussion of the commerce of Savannah were given in my annual report for 1890, to which I respectfully refer for details in this connection.

The railroads now centering in Savannah are the Charleston and Savannah, the South Bound, the Central of Georgia, the Savannah, Americus and Montgomery, and the Savannah, Florida and Western. Railroads under construction are the Macon and Atlantic, the Middle Georgia and Atlantic, the Macon and Dublin, and the Florida Central and Peninsular.

In addition to the railroads the Savannah River, navigable as far as Augusta, a distance of 202 miles by the river, for boats drawing from 4 to 5 feet, affords another means of communication with the interior, and many small steamers and sailing craft ply the waters of the inland route, along the adjacent coast, gathering the products of sea and of the coast plantations for transshipment at Savannah.

These avenues of commerce bring to Savannah the cotton, lumber, naval stores, and farm and mineral products of large portions of the States of Georgia, South Carolina, Florida, Alabama, and Tennessee, as well as other classes of through freights from the West and Northwest.

Regular lines of steamships have been established between this port and Boston, New York, Philadelphia, and Baltimore. These lines comprise a total of 12 steamships, of which 7 are to New York, 2 to Boston, 2 to Baltimore, and 1 to Philadelphia. They make yearly more than 400 voyages and carry about 663,000 tons of freight.

On the inland waters there are seven small steamers plying between Savannah and adjacent ports, making annually from 500 to 600 trips and carrying about 67,000 tons of freight, valued at over $4,000,000.

The chief articles of export are cotton, lumber, and naval stores, of which the present annual shipments may be given in round numbers as follows: Of cotton, 1,027,000 bales; of lumber, over 116,000,000 feet, and of naval stores, 273,566 barrels of turpentine and 1,002,000 barrels of rosin.

There are also large shipments of fruit and vegetables to northern ports, aggregating over 1,000,000 packages annually, and some of the phosphate rock from the Florida mines is seeking an outlet to foreign ports at Savannah.

The total annual tonnage of the port, inward and outward bound, is over 2,000,000 tons.

Although the volume of the business of this port has been maintained, the prices obtained for cotton, lumber, and naval stores, the leading exports, have been so low and unsatisfactory during the past year that the value of the exports has decreased considerably.

Past improvement of the harbor has resulted in increasing the available depth at high water from 14.5 to from 22 to 23 feet. The increase in the value of exports since the year 1873, when the work was begun is proportional to the cube of the increase in the depth of water during the same period. If the same proportion should hold till a depth of 26 feet is reached, the value of the exports alone would then be about $150,000,000. The annual saving in freight rates alone, due to the increased depth, amounts to more than the total sum of money expended by the United States upon the harbor. Rates of marine insurance have also been reduced.

TABLE 1.—*Cotton receipts at Savannah from 1872 to 1892.*

Season, Aug. 31 to Sept. 1—	No. of bales.	Season, Aug. 31 to Sept. 1—	No. of bales.
1872-'73	612,794	1882-'83	817,670
1873-'74	630,372	1883-'84	655,749
1874-'75	614,478	1884-'85	728,087
1875-'76	523,244	1885-'86	803,359
1876-'77	477,435	1886-'87	804,412
1877-'78	597,449	1887-'88	892,318
1878-'79	693,764	1888-'89	828,168
1879-'80	741,018	1889-'90	956,517
1880-'81	889,383	1890-'91	1,139,560
1881-'82	737,056	1891-'92	1,027,816

TABLE 2.—*Steamship lines.*

Lines.	Savannah to—	Steamers.	Voyages.	Freight.
Ocean Steamship Co	New York	7	207	423,668
New England and Savannah Steamship Co *	Boston	2	69	101,925
Merchants' and Miners' Transportation Co	Baltimore	2	98	82,237
Ocean Steamship Co	Philadelphia	1	37	55,326
Total		12	411	663,156

* Controlled by Ocean Steamship Company.

MISCELLANEOUS.

The work is located in the collection district of Savannah, Ga. Savannah is the nearest port of entry. Amount of duties collected in 1892, $47,687. The nearest light-houses are those upon the river, and forts Oglethorpe and Pulaski are the nearest forts.

Since the existing project for improving Savannah Harbor was adopted the following appropriations have been made for this work:

By act of Congress of—

August 11, 1888 (unexpended balance)	$4,035.05
September 19, 1890	350,000.00
July 13, 1892	318,750.00
March 3, 1893	1,000,000.00
Total	1,672,785.05

In accordance with the provisions of the river and harbor act of July 13, 1892, contracts have been entered into for the execution of all of the work necessary to complete the present project of improvement. It is unfortunate that one-fourth of the appropriation made on March 3, 1893, does not become available until July 1, 1894, inasmuch as operations are now being carried on vigorously and it is expected that all funds available will be expended before the close of the calendar year.

The sum asked for during the next fiscal year is $1,500,000. It is important that operations in Savannah Harbor should not be suspended, and the most desirable and satisfactory results can not be obtained with an expenditure during the year of a less amount.

The total expenditures under the present project to June 30, 1893, including all outstanding liabilities, were $827,669.48.

Money statement.

July 1, 1892, balance unexpended		$8,563.75
Amount appropriated by act approved July 13, 1892		318,750.00
Amount appropriated by sundry civil act approved March 3, 1893		1,000,000.00
		1,327,313.75
June 30, 1893, amount expended during fiscal year		327,211.55
July 1, 1893, balance unexpended		1,000,102.20
July 1, 1893, outstanding liabilities	$154,986.63	
July 1, 1893, amount covered by uncompleted contracts	819,705.12	
		974,691.75
July 1, 1893, balance available		25,410.45
Amount (estimated) required for completion of existing project		1,831,250.00
Amount that can be profitably expended in fiscal year ending June 30, 1895		1,500,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.		

Abstract of proposals for improving harbor at Savannah, Ga., opened on December 27, 1892, by Capt. O. M. Carter, Corps of Engineers.

No.	Name and address of bidder.	(1) Mattresses (350,000 square yards).		(2) Fascines (300,000 cubic yards).		(3) Pile work (50,000 linear feet).		(4) Cluster fender piles (200 clusters).	
		Price.	Amount.	Price.	Amount.	Price.	Amount.	Price.	Amount.
1	National Dredging Co., George G. Barker, vice-president, Wilmington, Del								
2	American Dredging Co., L. Y. Schermerhorn, president, Philadelphia, Pa	$1.08	$378,000	$1.80	$540,000	$1.75	$87,500	$60.00	$12,000
3	P. Sanford Ross, Jersey City, N. J	1.10	385,000	1.79	537,000	1.44	72,000	47.00	[illegible]
4	W. F. McCauley, Savannah, Ga	1.13	395,500	1.74	522,000	1.55	77,500	51.00	10,200
5	The Atlantic Contracting Co., John F. Gaynor, president, New York, N. Y	.95	332,500	1.60	480,000	1.60	80,000	50.00	10,000

Abstract of proposals for improving harbor at Savannah, Ga., etc.—Continued.

No.	Name and address of bidder.	(5) Groups of tie piles (1,500 groups).		(6) Sawn timber (800,000 feet B. M).		(7) Iron bolts (200,000 pounds).	
		Price.	Amount.	Price.	Amount.	Price.	Amount.
1	National Dredging Co., George G. Barker, vice-president, Wilmington, Del	....	....	....	....	....	....
2	American Dredging Co., L. Y. Schermerhorn, president, Philadelphia, Pa	$24.00	$36,000	$35.00	$28,000	$0.05	$10,000
3	P. Sanford Ross, Jersey City, N. J	24.00	36,000	33.00	26,400	0.45	9,000
4	W. F. McCauley, Savannah, Ga.	20.00	30,000	33.00	26,400	0.04	8,000
5	The Atlantic Contracting Co., John F. Gaynor, president, New York, N. Y	20.00	30,000	30.00	24,000	0.05	10,000

No.	Name and address of bidder.	(8) Riprap stone (200,000 cubic yards.)		(9) Large stone (50,000 tons).		Total.
		Price.	Amount.	Price.	Amount.	
1	National Dredging Co., George G. Barker, vice-president, Wilmington, Del	....	....	....	....	....
2	American Dredging Co., L. Y. Schermerhorn, president, Philadelphia, Pa	$3.00	$600,000	$2.80	$140,000	$1,831,500
3	P. Sanford Ross, Jersey City, N. J	3.04	608,000	2.56	128,000	1,810,800
4	W. F. McCauley, Savannah, Ga.	3.08	616,000	2.60	130,000	1,815,600
5	The Atlantic Contracting Co., John F. Gaynor, president, New York, N. Y	2.95	590,000	2.60	130,000	*1,686,500

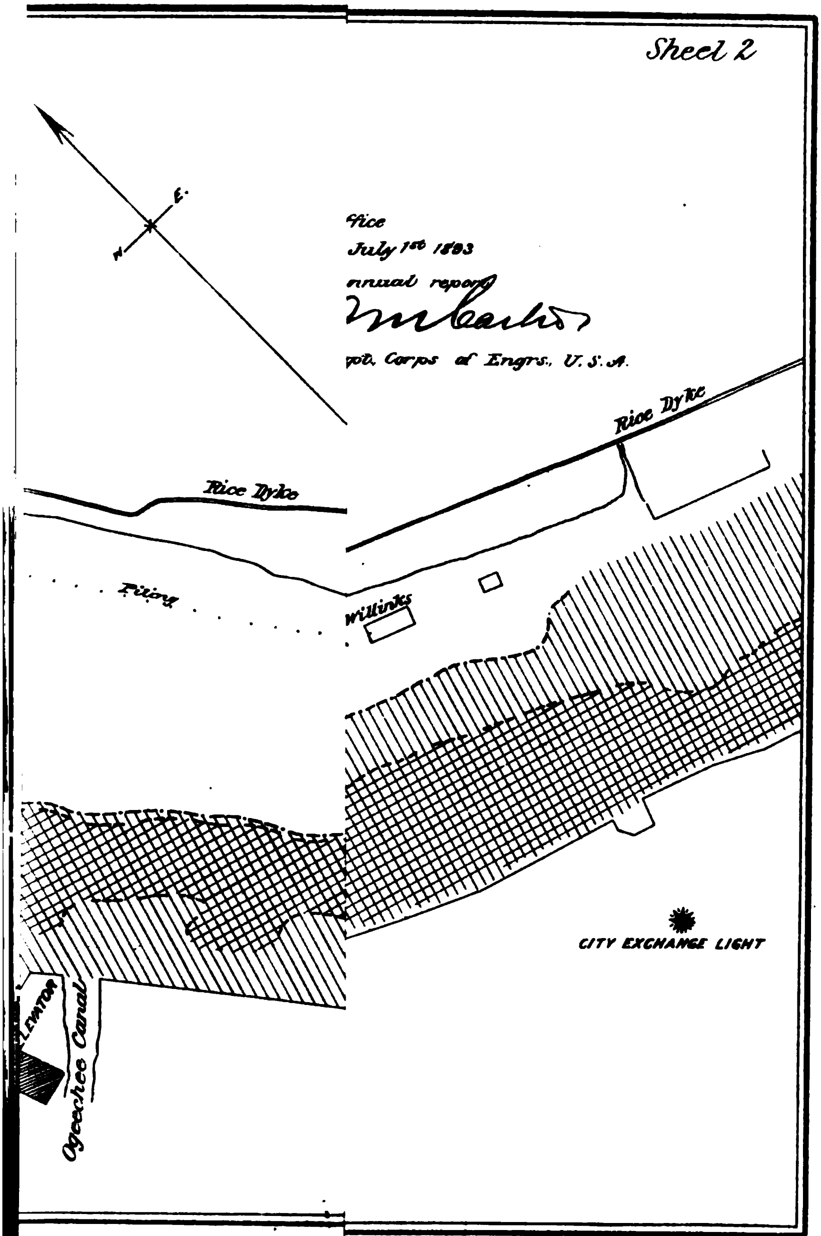
No.	Name and address of bidder.	(10) Wharfing or revetment (2,500 linear feet).		(11) Dredging (7,000,000 cubic yards).		Total.	Grand total.
		Price.	Amount.	Price.	Amount.		
1	National Dredging Co., George G. Barker, vice-president, Wilmington, Del	$50.00	$125,000	$0.17 9/10	$1,253,000	$1,378,000	....
2	American Dredging Co., L. Y. Schermerhorn, president, Philadelphia, Pa	38.00	95,000	.17¼	1,207,500	1,302,500	$3,134,000
3	P. Sanford Ross, Jersey City, N. J.	40.00	100,000	.16	1,120,000	*1,220,000	3,030,800
4	W. F. McCauley, Savannah, Ga.	43.00	107,500	.17	1,190,000	1,297,500	3,113,100
5	The Atlantic Contracting Co., John F. Gaynor, president, New York, N. Y	40.00	100,000	.17½	1,225,000	1,325,000	3,011,500 *2,906,500

* It is recommended that the bids of the Atlantic Contracting Company, of New York, N. Y., John F. Gaynor, president, for jetty work (the first nine items), and that of P. Sanford Ross, Jersey City, N. J., for dredging (tenth and eleventh items) be accepted, they being the lowest responsible bidders for the best and most suitable material and service.

Amount for which the Secretary of War is authorized to enter into contracts, $3,150,000.

Amount available under the present appropriation, $310,000.

LEWTON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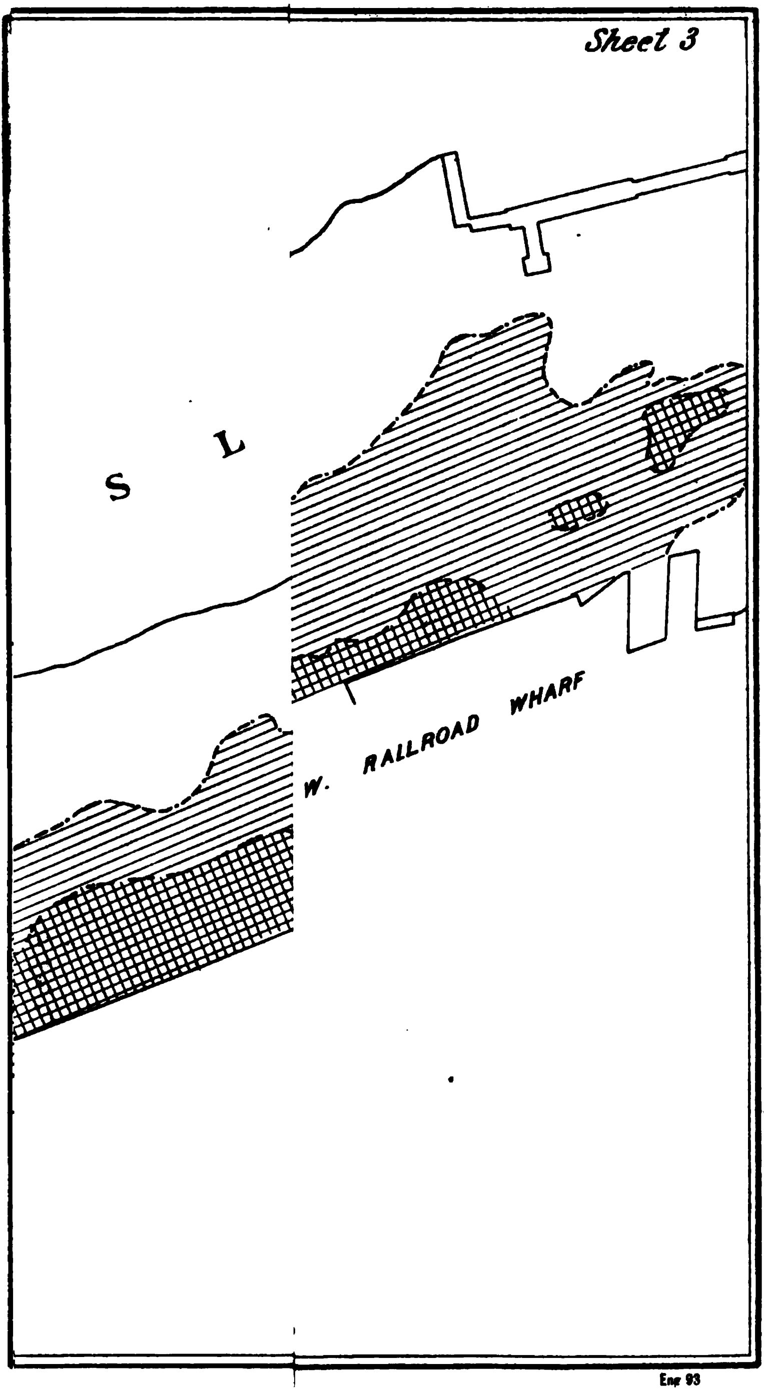

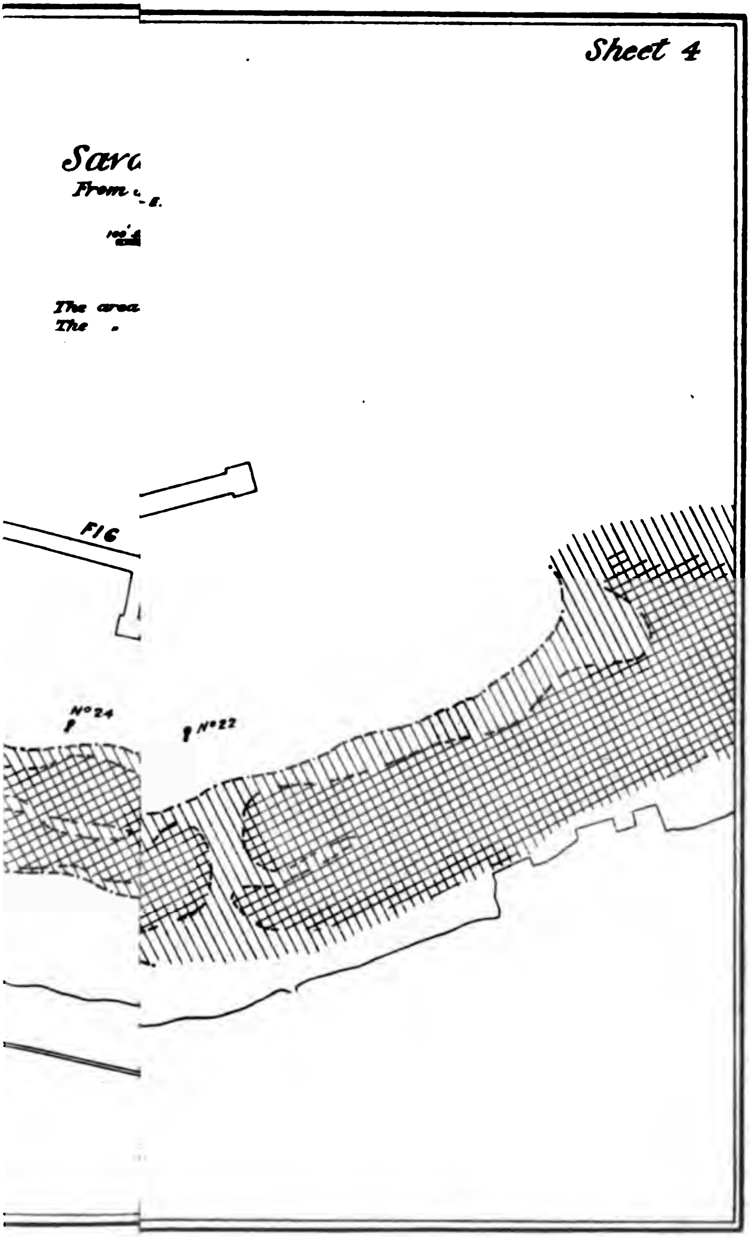

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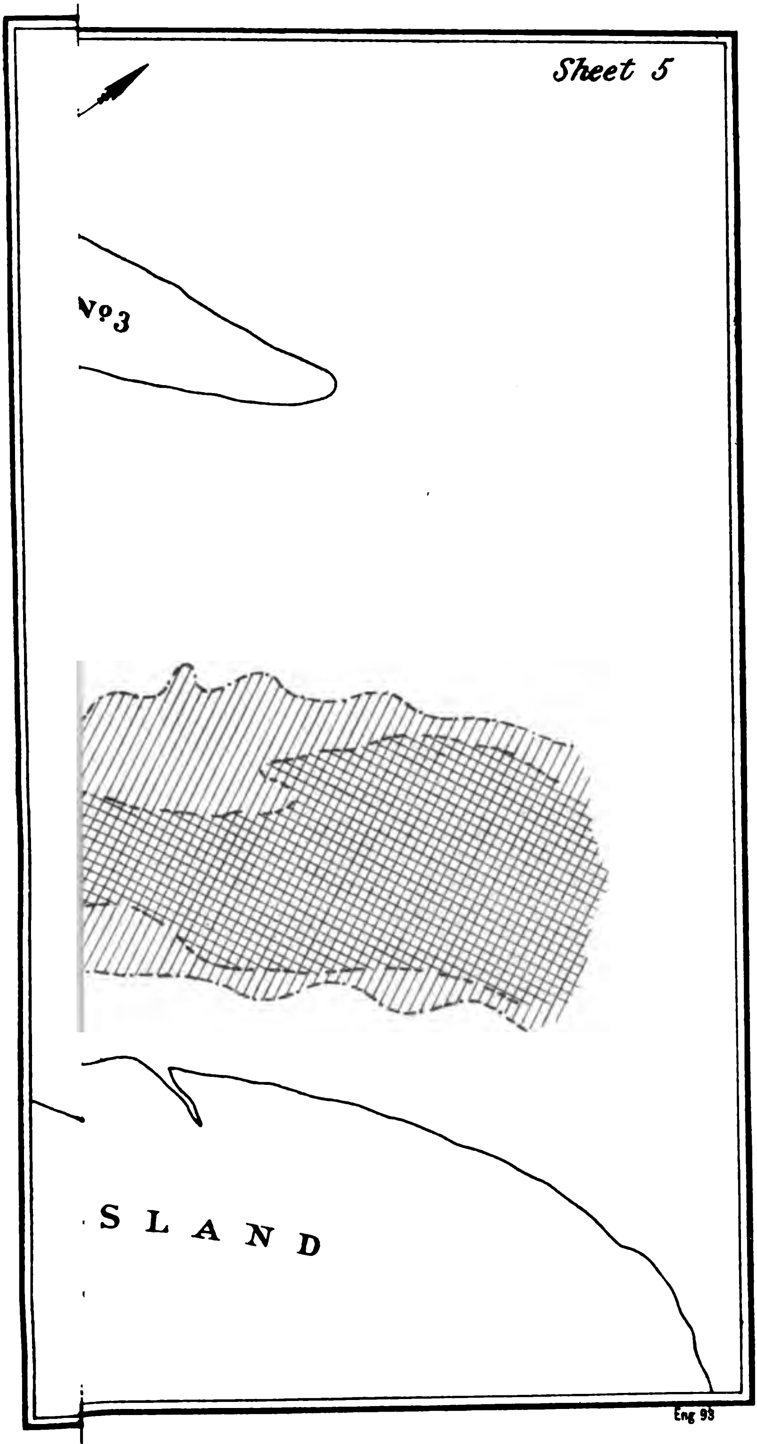
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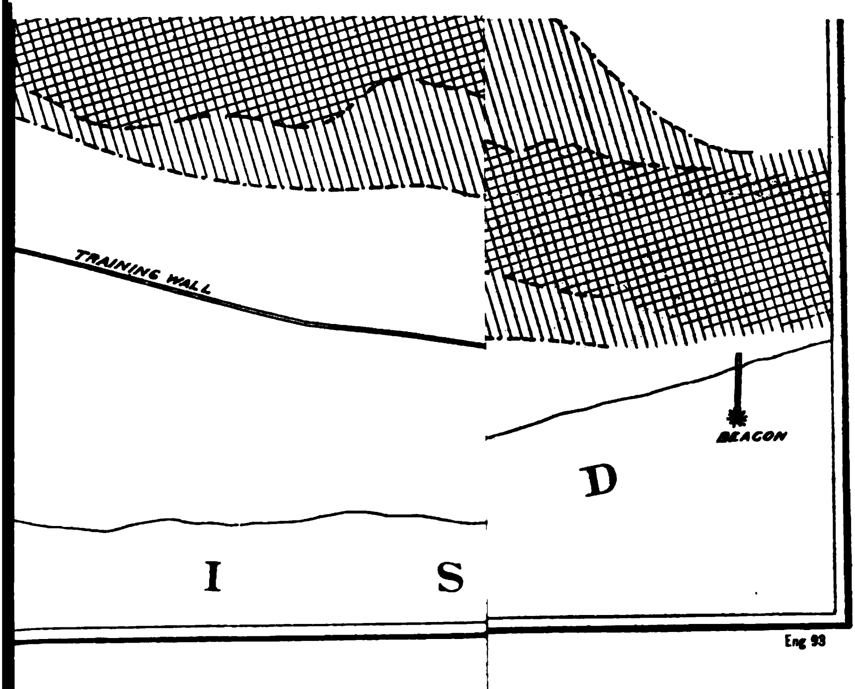

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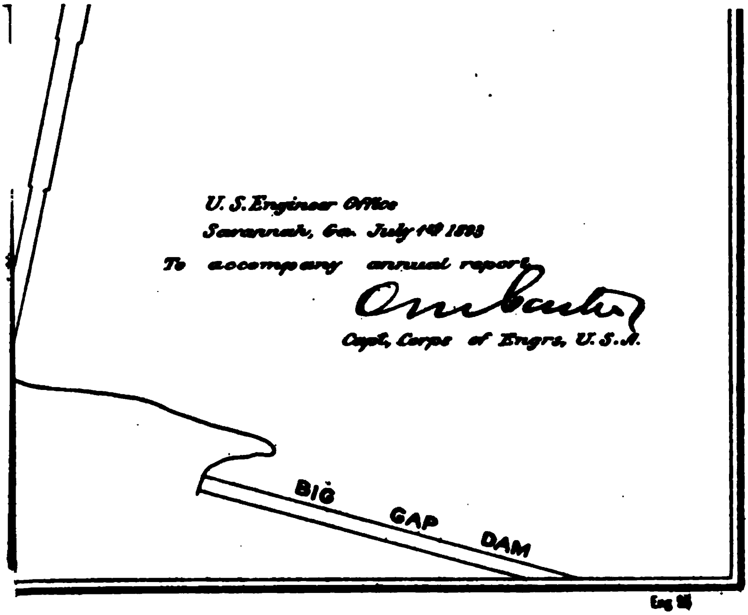

U. S. Engineer Office
Savannah, Ga. July 1st 1893
To accompany annual report.
O M Carter
Capt. Corps of Engrs, U. S. A.

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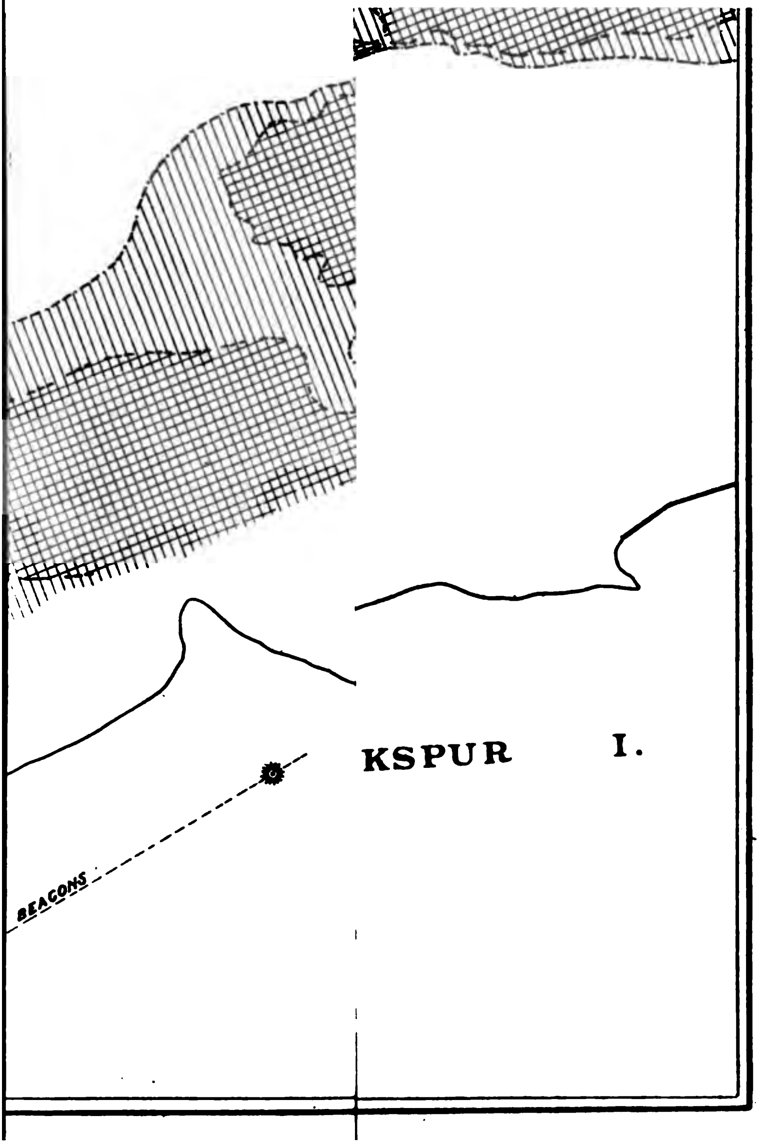
KSPUR I.
BEACONS

COMMERCIAL STATISTICS.

Cotton statistics of the port of Savannah, Ga., for the commercial year ending A 1892.

Receipts from all sources.	Quantity.	Weight.
	Bales.	*Pounds.*
Upland	985, 732	479, 854, 337
Sea Island	42, 084	16, 994, 360
Total	1, 027, 816	496, 848, 697

Exports from Savannah.	Upland.
	Bales.
Coastwise	495, 254
Great Britain	159, 770
France	29, 316
Other continental ports	301, 239
Mill consumption and burnt	2, 317
Reshipped to interior	192
Total	988, 088

Total exports, etc.	Quantity.	Weight.
	Bales.	*Pounds.*
Upland	988, 088	481, 001, 238
Sea Island	42, 160	17, 025, 051
Total	1, 030, 248	498, 026, 289

Foreign exports:		
Upland	bales	490, 325
Sea Island	do	16, 718
Average value per bale:		
Upland		$40. 55
Sea Island		67. 57

Coastwise exports:
Upland ....bales..
Sea Island ....do....
Average weight per bale:
Upland....pounds..
Sea Island ....do....

Arrival and clearance of vessels and commerce at Savannah, Ga., from January 1, to December 31, 1892.

ARRIVED.

Year.	Coastwise.			Foreign ports.						Total.		
				American vessels.			Foreign vessels.					
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.
1873	463	381, 595	11, 934	34	16, 140	383	213	119, 316	2, 999	710	517, 051	15, 316
1874	418	354, 700	10, 048	66	41, 030	847	284	182. 517	4, 232	768	578, 247	15, 127
1875	370	310, 877	10, 102	67	39, 832	781	222	145, 748	3, 290	659	495, 923	14, 173
1876	355	320, 015	10, 348	58	40, 298	987	260	169, 640	3, 865	673	530, 496	15, 200
1877	333	379, 826	10, 867	54	40, 948	951	287	168, 247	3, 950	674	589, 021	15, 768
1878	322	385, 532	10, 688	61	45, 208	576	326	235, 787	5, 814	709	666, 527	18, 078
1879	319	414, 794	8, 235	30	21, 994	1, 576	279	198, 040	3, 960	628	634, 828	12, 634
1880	338	446, 881	9, 996	14	7, 724	439	244	172, 224	3, 533	596	626, 829	13, 699
1881	383	508, 422	11, 069	21	10, 729	170	254	151, 463	3, 474	658	670, 614	14, 780
1882	391	544, 488	12, 605	11	4, 865	237	204	115, 061	2, 718	606	666, 374	16, 429
1883	380	468, 226	10, 659	10	4, 115	106	160	87, 020	1, 965	550	559, 366	12, 714
1884	388	482, 917	13, 735	14	5, 632	90	287	174, 676	3, 984	689	663, 225	17, 835
1885	395	493, 610	14, 622	12	5, 058	116	251	163, 321	3, 416	658	668, 989	18, 163
1886	393	503, 073	14, 534	10	5, 952	125	268	177, 229	3, 719	671	686, 254	18, 438
1887	430	543, 235	15, 127	8	2, 725	185	231	130, 136	2, 800	669	676, 096	17, 987
1888	411	539, 576	14, 907	8	3, 560	60	229	146, 075	3, 288	648	689, 211	18, 306
1889	409	561, 463	15, 547	12	6, 563	111	309	215, 865	4, 530	730	783, 891	20, 231
1890	483	717. 561	19, 178	9	2, 303	69	300	193, 263	4, 058	792	913, 217	23, 305
1891	484	719, 328	19, 014	13	4, 778	123	325	238, 123	4, 790	822	962, 229	23, 927
1892	449	692, 726	18, 345	6	3, 000	51	358	259, 482	5, 228	813	955, 908	23, 624

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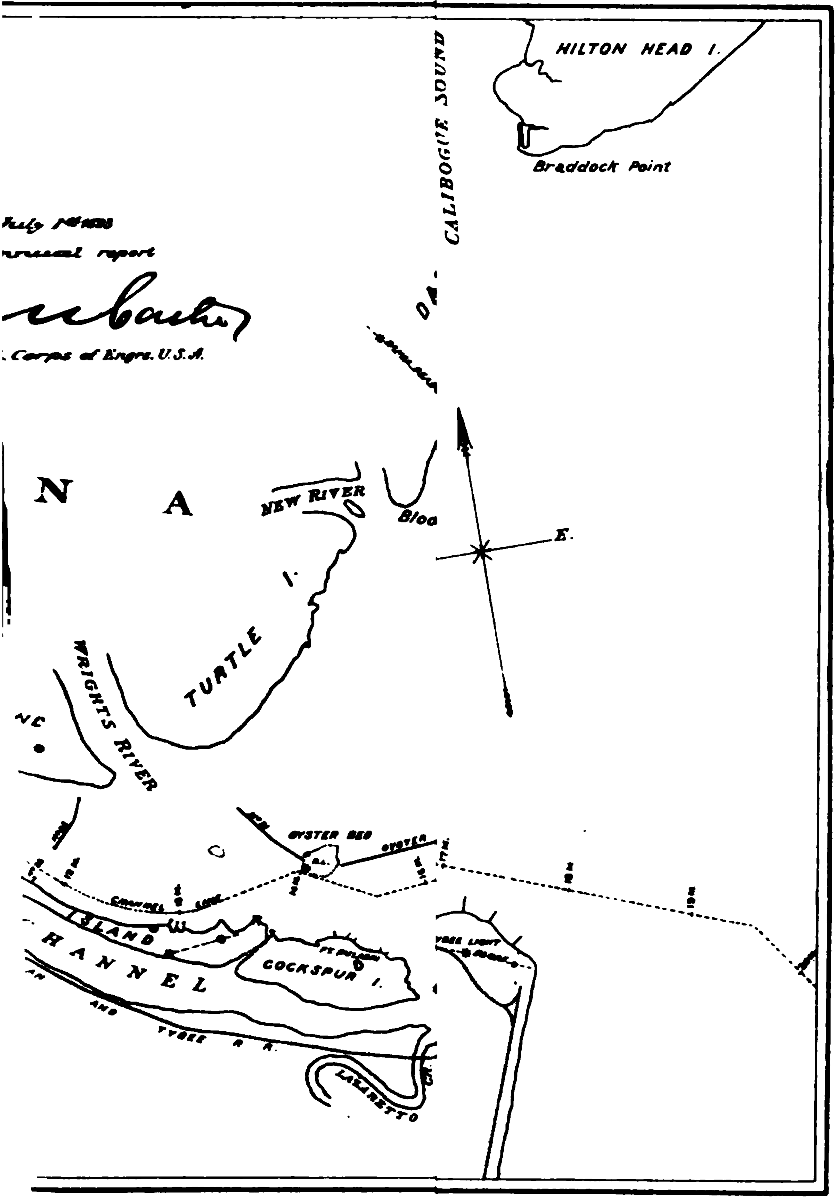

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Arrival and clearance of vessels and commerce at Savannah, Ga., from January 1, 1873, to December 31, 1892—Continued.

CLEARED.

Year.	Coastwise.			Foreign ports.						Total.			Greatest draft.
				American vessels.			Foreign vessels.						
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	
													Feet.
1873...	466	398, 050	13, 749	65	30, 102	669	224	129, 164	3, 194	755	557, 316	17, 632	17. 50
1874...	480	407, 295	12, 748	71	40, 397	822	229	145, 038	3, 437	780	592, 730	17, 007	17. 50
1875...	319	234, 831	9, 376	72	39, 311	804	195	128, 086	2, 924	586	452, 228	13, 104	17. 50
1876...	410	361, 999	11, 222	80	40, 483	1, 163	185	119, 699	2, 827	675	531, 781	15, 212	17. 75
1877...	400	439, 370	12, 081	65	44, 829	1, 066	161	103, 342	2, 489	626	587, 541	15, 736	18. 22
1878...	378	418, 958	10, 475	64	40, 128	1, 255	260	183, 757	5, 375	702	642, 843	17, 105	18. 50
1879...	365	442, 734	8, 834	36	24, 891	497	223	156, 470	3, 129	624	624, 095	12, 460	17. 75
1880...	310	434, 864	10, 108	26	12, 536	271	242	168, 255	3, 446	578	615, 655	13, 825	18. 33
1881...	369	508, 422	11, 458	22	13, 052	253	261	180, 579	3, 745	652	702, 053	15, 456	19. 00
1882...	350	506, 213	11, 917	23	9, 155	205	209	135, 375	3, 023	582	650, 743	15, 145	19. 00
1883...	355	415, 720	9, 780	10	4, 115	90	165	87, 400	2, 015	530	507, 235	11, 885	18. 25
1884...	360	452, 802	13, 363	15	5, 634	131	288	194, 075	4, 315	663	652, 411	17, 809	19. 00
1885...	414	502, 773	14, 072	20	8, 722	148	228	154, 858	3, 344	662	666, 353	18, 164	20. 17
1886...	378	473, 134	13, 912	3	939	24	262	194, 793	3, 970	643	668, 867	17, 906	20. 00
1887...	380	480, 030	14, 167	4	678	29	269	202, 656	4, 186	653	683, 364	18, 382	20. 00
1888...	382	507, 075	14, 231	8	2, 583	63	233	167, 836	3, 557	623	677, 494	17, 851	......
1889...	395	540, 293	15, 505	7	1, 323	51	307	226, 181	4, 601	711	767, 747	20, 157	......
1890...	452	613, 227	18, 815	14	4, 087	161	323	248, 013	5, 078	789	915, 327	24, 054	20. 75
1891...	445	666, 900	18, 200	4	9, 909	208	939	271, 067	5, 429	788	957, 876	2[illegible], 837	20. 75
1892...	453	685, 620	18, 285	7	1, 766	48	353	263, 166	5, 151	813	950, 552	23, 484	21. 60

T. F. JOHNSON,
Collector.

Capt. O. M. CARTER,
Corps of Engineers, U. S. A.

COMMERCE.

Years.	Value of exports.	Value of imports.	Duties collected.	Years.	Value of exports.	Value of imports.	Duties collected.
1877..........	$32, 103, 853	$36, 307, 908	$34, 959. 93	1885..........	$48, 313, 216	$49, 881, 080	$45, 161. 40
1878..........	40, 028, 988	42, 948, 465	23, 364. 35	1886..........	51, 033, 190	51, 118, 524	35, 455. 53
1879..........	40, 901, 421	43, 064, 472	27, 778. 73	1887..........	54, 774, 082	52, 659, 223	48, 837. 12
1880..........	47, 836, 411	45, 522, 480	78, 458. 41	1888..........	56, 435, 601	53, 412, 920	98, 213. 75
1881..........	58, 985, 901	48, 716, 900	356, 550. 22	1889..........	62, 892, 429	55, 062, 710	58, 815. 54
1882..........	52, 004, 248	45, 952, 105	61, 148. 70	1890..........	84, 584, 326	68, 229, 825	57, 542. 57
1883..........	53, 915, 934	47, 609, 796	65, 245. 34	1891..........	83, 367, 157	67, 218, 000	56, 714. 50
1884..........	46, 425, 513	49, 112, 316	49, 147. 28	1892..........	67, 211, 175	54, 119, 194	47, 687. 00

N 2.

IMPROVEMENT OF SAVANNAH RIVER, GEORGIA.

The Savannah River is formed by the junction of the Tugaloo and Keowee, and flows in a southeasterly direction to the sea.

A detailed description of this river is found in my report of the examination and survey of the portion above Augusta, printed as House Ex. Doc. No. 213, Fifty-first Congress, first session, and in my report of the survey of the river between Augusta and Savannah, dated June 30, 1890, and printed as Appendix O 2, Annual Report of the Chief of Engineers for 1890, pp. 1328–1363.

For a special history of past work see page 1029, Annual Report of the Chief of Engineers for 1888, and the annual reports of the same officer since that date.

ORIGINAL CONDITION.

For the greater part of the year the river is navigable for steam boats drawing from 4 to 5 feet of water, but during the low-water season there are various shoals in the upper portion of the river with low-water depths of not more than about 3 feet. The chief obstructions to navigation consist of sand and gravel bars, overhanging trees, snags, and sunken logs.

PLAN OF IMPROVEMENT.

The plan of improvement, as outlined in my report of June 30, 1890, provides for the establishment of a navigable steamboat channel 5 feet deep at ordinary summer low water between the cities of Augusta and Savannah.

This is to be accomplished by (1) removing sand and gravel bars; (2) regulating portions of the river, revetting caving banks, and closing incipient cut-offs; (3) removing snags and logs from the channel and overhanging trees from the banks of the stream.

The cost of the improvement is estimated in round numbers at $332,000, provided funds are regularly and adequately supplied.

SUMMARY OF OPERATIONS PRIOR TO JULY 1, 1892.

The first appropriation ever made for the Savannah River was expended on a snag boat built for use upon this river and the Altamaha. This boat began work upon the river on February 17, 1882, and has been employed at intervals since that date, continuous work having been impossible on account of insufficiency of funds. Irregular and inadequate appropriations have prevented the selection of the most suitable seasons for doing work. Then, too, the boat has been tied up for months at a time in a climate where decay is very rapid. As a result numerous and costly repairs have had to be made which would not have been needed had the boat been kept in commission. In 1889 the boat had become rotten and unserviceable and was rebuilt at Abbeville, Ga., under contract with Messrs. M. A. Sweeney & Bro., of Jeffersonville, Ind., and outfitted at Savannah. In all the boat was employed 685 days upon the river between Augusta and Savannah, removing during that time 1 sunken steamboat, 82 piles, 1,578 snags, logs, and stumps, and 4,935 overhanging trees, besides a number of wrecked flats and a number of other minor obstructions. Many of the obstacles were very large and troublesome, and their removal without a suitable snag boat would have been impossible.

In 1883–1885 wing dams, projecting from the South Carolina bank, were built for the improvement of Gardner Bar, opposite the city of Augusta, contracting the low-water way from 650 to 350 feet. In the same year and in 1891 shore protection was put in at various points along and below the city front. Contracting works have also been constructed at Course Bar, Sand Bar Ferry, and Blue House Bar, situated 2, 4, and 6 miles, respectively, below the city of Augusta.

At Course Bar 7 wing dams have been built, 3 on the right bank and 4 on the left, reducing the low-water way from 650 to 350 feet. At Sand Bar Ferry 5 wing dams were built, 1 on the right bank and 4 on the left, reducing the width of the low-water way from 650 to 400 feet, and in 1889 two additional wing dams were constructed, on the right side of the river and the old work was raised and repaired, reducing the low-water width to 350 feet.

At Blue House Bar 7 wing dams were built, 4 on the right bank and on the left, reducing the width of the low-water way from 650 to 400 et. In 1889, the channel having shifted, a new dam, 580 feet long, as constructed, springing from the right bank, and three additional ort spurs were built on the left bank. Portions of the old dams were moved and the resulting low-water channel was 350 feet in width.

These various works have been built of brush fascines loaded with ravel and riprap stone. In their construction and occasional repair ere have been used a total of 22,481.01 cubic yards of brush fascines nd 12,776.56 cubic yards of gravel and stone. All work, with the ex- ption of that done by the snag boat, has been done by contract.

Up to July 1, 1892, the total expenditures for the work under the ex- ting project, including all outstanding liabilities, were $24,076.75.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1893.

Active operations were commenced on October 27, 1892, by the snag oat *Toccoa* and were continued to June 5, 1893. In all the boat was mployed 196 days upon the river between Augusta and Savannah, nd removed during that time 1,041 snags, 8,406 overhanging trees, nd 89 logs, employing 45 pounds of explosives.

On June 19 bids were opened for the construction and repair of ing dams and shore protection near the city of Augusta and the con- ract was awarded to Albert J. Twiggs, of Augusta, Ga.

CONDITION OF WORK JUNE 30, 1893.

The depth of water along the city wharves at Augusta is ample. he spur dams at Gardner Bar, opposite the city, are now in good con- ition, the breaks in them having been repaired during the past year nd their crests raised to a uniform height of about 2 feet above sum- er low water. The spurs designed to protect the river bank below he city of Augusta are in good condition and have thus far accom- lished their purpose. All of the dams at Course Bar and Sand Bar erry are now in good condition, and the depth of water on the shoals about 6 feet. The dams at Blue House Bar remain as described in y annual report for 1891. Though damaged to some extent, they till fulfill their object and maintain a sufficient depth on the shoal. At he Port Royal and Augusta Railway Bridge the main current and best hannel pass to the left of the draw opening, thus rendering it diffi- ult for boats to pass through, since their approach is at an angle with he direction of the current.

All snags, logs, and overhanging trees obstructing the river between avannah and Augusta have been removed by the snag boat *Toccoa* uring the year, and the channel is now in very good condition.

COMMERCE AND NAVIGATION.

A detailed statement of the sources whence the commerce of this ver is derived, of its value, and of the probable effect of the comple- on of the works of improvement, is given in my report on the survey f the river, dated June 30, 1890, and printed as part of Appendix O 2, nnual Report of the Chief of Engineers for 1890.

Prior to the inauguration of the works of improvement the commerce f the river, especially in the way of through shipments, was unim- ortant, as the condition of the channel rendered navigation uncertain nd unsafe.

The improvement of the river has been accompanied by a steady increase in the volume of river traffic (especially in manufactured cotton goods from Augusta, as through freight for exportation) and by a decrease in the rates of freight, both of which are more than commensurate with the expenditures involved. In fact, the annual commerce has increased at the rate of $10 for every dollar expended by the United States, and freight rates have been reduced about 20 per cent.

The exports from the river bottom are mainly cotton, naval stores, lumber, and wood, while the imports are fertilizers, camp and mill supplies, cotton ties and bagging, and manufactured articles. Two steamers are engaged in the river traffic, carrying annually about 30,000 tons of freight, valued at $2,875,009. The falling off in the tonnage of the river carried by steamers is due to the decrease in supply of naval stores. In addition to the freights carried by the various steamers, the river valley affords logs, hewn and sawed timber, spars, and cord wood. The timber is rafted down the river. A large portion of the cord wood is lightered to Savannah, while the remainder is used as fuel by the river boats. The hard wood sawed and the shingles cut along the river are shipped to Savannah by boat. It is estimated that about 37,600 tons of logs, timber, and cord wood, valued at about $153,480, are annually rafted or lightered to Savannah and other places along the river. This makes the total annual shipments of the Savannah River 67,477 tons, valued at $3,028,489.

Commercial statistics, Savannah River, Georgia, for fiscal year ending June 30, [illegible].

Articles.	Tons.	Value.	Articles.	Tons.	Value.
Cotton	5,115	$870,125	Merchandise	10,845	$1,6[illegible]
Rosin	6,285	62,850	Cord wood	2,580	[illegible]
Turpentine	4,130	244,800	Passengers	397	[illegible]
Timber	35,000	140,000			
Fertilizer	3,125	62,500	Total	67,477	3,0[illegible]

Statement of steamboats plying the Savannah River, Georgia, for fiscal year ending June 30, 1893.

Name.	Draft unloaded.	Tonage net.	Terminal points.
	Inches.		
Ethel	24	218.61	Augusta and Savannah
Katie	34	569.23	

MISCELLANEOUS.

The work is located in the collection district of Savannah Ga. Savannah is the nearest port of entry. Amount of duties collected in 1892, $47,687. Forts Oglethorpe and Pulaski are the nearest forts and the nearest light-houses are those upon the river below Savannah.

Since the existing project for improving Savannah River was adopted the following appropriations have been made for this work:

By act of Congress of—

August 11, 1888 (balance unexpended)	$[illegible]
September 19, 1890	25,[illegible]
July 13, 1892	35,[illegible]
Total	60,[illegible]

The total expenditures under the present project up to June 30, 1893, including all outstanding liabilities, were $34,105.35.

It is proposed to expend any available funds and any funds that may become available during the year in the removal of obstructions, in the construction of works of shore protection, and in the improvement of shoals in the river, according to the plan contained in my report of June 30, 1890.

The sum of $75,000 can be advantageously and economically expended during the coming year.

No permanent improvement can be effected, as new obstructions, caused by snags and logs, form during every high-water season. They should, however, become fewer in number each year. From $3,000 to $5,000 will be required for the annual maintenance of the completed work. The work of removing obstructions has been under the local charge of Mr. R. S. Burnett, assistant engineer, whose report is appended hereto.

Money statement.

July 1, 1892, balance unexpended		$943.16
Amount appropriated by act approved July 13, 1892		35,000.00
		35,943.16
June 30, 1893, amount expended during fiscal year		9,919.57
July 1, 1893, balance unexpended		26,023.59
July 1, 1893, outstanding liabilities	$109.03	
July 1, 1893, amount covered by uncompleted contracts	20,000.00	
		20,109.03
July 1, 1893, balance available		5,914.56
Amount (estimated) required for completion of existing project		272,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895		75,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.		

Abstract of proposals for constructing and repairing wing dams and shore protection in the Savannah River, below Augusta, Ga., opened on June 19, 1893, by Capt. O. M. Carter, Corps of Engineers.

No.	Name and address of bidder.	Price per cubic yard.		Total.
		Mattresses.	Stone.	
1	Albert J. Twiggs, Augusta, Ga.*	$0.74	$1.74	$12,510
2	The Atlantic Contracting Co., John F. Gaynor, president, New York, N. Y.	.87	1.60	12,925
3	Colin McK. Grant, Charleston, S. C.†	1.00	2.40	17,100

* Bid recommended for acceptance, he being the lowest responsible bidder for the best and most suitable services.

† Informal bid.

Amount available, $22,000.

REPORT OF MR. R. S. BURNETT, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Savannah, Ga., July 3, 1893.

CAPTAIN: I respectfully submit the following report of snagging operations on the Savannah River, between Savannah and Augusta, during the fiscal year ending June 30, 1893.

The snag boat *Toccoa* was repaired and outfitted at Savannah and left for upper river October 26.

Work was commenced at Bridge Point, 27 miles above Savannah, and the chan was thoroughly cleared of snags from that point to Augusta. Work was suspen during the month of March on account of high water. Work was finished Jun No accidents have occurred to steamboats or other craft during the year, on acco of obstructions in the channel.

There has been a decrease in the amount of naval stores shipped on the ri owing to a decrease in the supply. There has been an increase in through frei from Augusta and also in general merchandise at various points along the river.

There have been removed from the channel 2,619 snags and stumps; 8,495 ov hanging trees and projecting logs were cut and removed from the banks.

Submitted with this report are the following statements:

(1) Summary of work done by months.
(2) Summary of work done by localities.
(3) Summary of work done from 1882 to 1893 inclusive.

Respectfully submitted.

R. S. BURNETT,
Assistant Engine

Capt. O. M. CARTER,
Corps of Engineers, U. S. A.

1. Summary of work by months, 1892-'93.

Month.	Total days worked.	Number of days removing obstructions.	Snags.* First class.	Snags.* Second class.	Snags.* Third class.	Stumps.	Overhanging trees cut. Over 8 inches.	Overhanging trees cut. Under 8 inches.	Logs on bank cut.
October	6	4	8	9	5	5	44	65	3
November	30	26	45	108	54	18	548	584	34
December	30	8	7	48	13	......	46	46	20
January	31	26	40	103	87	17	266	360	9
February	28	24	25	90	24	5	375	404	6
March	6	......	......	......	......	......	......	......	......
April	30	25	30	102	30	11	735	2,045	6
May	31	25	40	109	20	17	949	1,904	11
June	4	2	4	7	9	1	31	4	......
Total	196	140	199	576	192	74	2,994	5,412	89

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* First-class snags are more than 2 feet in diameter at butt. Second-class snags are more tha inches in diameter at butt. Third-class snags are under 8 inches in diameter at butt. All logs trees under water are considered snags.

2. *Summary of work by localities, 1892-'93.*

Distance above Savannah, Ga.	Snags.			Stumps.	Overhanging trees.			Logs on bank cut.	Explosives used.	Distance above Savannah, Ga.	Snags.			Stumps.	Overhanging trees.			Logs on bank cut.	Explosives used
	First class.	Second class.	Third class.		Pulled back.	Over 8 inches.	Under 8 inches.				First class.	Second class.	Third class.		Pulled back.	Over 8 inches.	Under 8 inches.		
Miles.									*Lbs.*	*Miles.*									*Lbs.*
20	4	6	5	1	...	4	......	4	....	102	5	6	2	....	...	46	37	....	....
20¼	....	1	4	....	...	27	4	....	....	102½	3	2	2	1	...	10	8	....	....
27	6	7	3	4	...	13	16	3	....	103	3	3	1	1	...	12	10	1	....
29	1	....	....	....	...	4	......	....	....	106	3	4	....	....	...	10	4	....	....
30½	1	4	....	....	...	103	187	....	....	112	2	3	1	....	...	......	......	6	....
31	2	7	1	3	...	2	......	....	....	113½	5	....	....	....	...	102	180	....	....
32¼	2	....	....	....	...	58	268	....	....	113¾	4	24	3	....	...	40	43	....	....
39¾	5	2	1	....	...	26	47	3	....	114	2	14	8	2	...	......	......	....	....
41½	1	1	1	....	...	150	275	....	....	114¼	....	5	2	....	...	68	90	....	....
42¾	2	2	2	1	...	33	49	....	....	114¾	....	8	6	....	...	91	94	....	....
43¾	1	3	5	1	...	30	135	....	....	115	1	12	5	10	...	160	123	....	....
48¾	1	1	1	....	...	43	168	....	....	115¼	4	10	4	....	...	57	12	16	....
49½	6	10	3	1	...	56	96	....	....	115¾	9	12	6	....	...	......	......	1	....
50	3	8	1	....	...	96	245	2	....	116	5	7	3	1	...	2	......	....	....
50¼	....	....	1	....	...	27	16	....	....	116½	4	6	6	....	...	21	39	....	....
54½	2	12	....	1	...	63	214	1	....	121¼	2	6	4	....	...	39	37	....	....
55½	3	8	3	4	...	87	400	2	....	128	1	6	3	....	...	......	......	....	....
5[illegible]½	3	11	2	....	...	83	213	....	....	128½	5	6	2	6	...	......	......	....	....
57½	2	7	....	1	...	......	......	....	....	131½	1	8	....	....	4	14	13	....	....
58½	9	21	5	2	...	......	......	2	....	152¼	....	2	4	....	...	......	......	....	....
59	4	10	15	....	...	......	......	....	10	153½	2	3	....	....	...	45	34	6	....
60	....	10	....	....	...	63	121	....	....	154½	2	11	4	....	...	39	32	....	....
63	2	13	1	....	...	141	467	....	....	154¾	....	7	....	....	...	185	334	....	....
63½	3	12	4	2	...	104	173	1	....	166½	1	13	5	....	...	1	......	....	13
65	6	18	4	1	...	131	265	....	1½	167½	2	10	2	....	...	......	12	11	11½
68½	5	12	3	1	...	84	166	....	....	168	....	5	....	....	...	......	......	3	....
78¾	1	9	3	....	...	31	44	....	....	171	1	9	2	....	...	2	5	1	....
80¼	2	7	3	1	...	12	27	....	....	176	6	4	3	5	...	5	15	....	....
81½	2	6	1	....	...	7	4	2	....	178½	....	....	....	5	...	56	119	....	....
83	6	7	3	....	...	5	3	....	....	178¾	....	5	2	....	...	57	78	....	....
83½	2	7	....	....	...	49	48	....	....	179½	....	5	3	....	...	54	49	....	....
88	....	11	1	....	...	......	......	....	....	179¾	....	9	2	....	...	16	225	....	....
89	2	1	....	....	...	28	17	....	....	180½	3	1	1	1	...	......	......	4	....
93¼	3	2	1	....	...	6	1	....	....	185	1	7	3	3	...	42	6	7	....
94	6	16	2	1	...	21	......	5	....	191¼	....	5	....	1	...	8	2	....	....
96	5	15	6	2	...	19	10	2	....	193	....	15	3	3	...	11	6	....	....
96¼	1	15	6	....	...	16	26	2	....	198	2	10	....	....	...	54	15	....	....
99	4	2	2	....	...	40	20	....	8	198¾	2	2	3	5	...	1	2	2	1
100¼	4	4	3	....	...	43	30	....	....	202	2	4	....	1	...	......	......	....	....
101	3	5	....	....	...	......	......	....	....										
101¼	1	14	1	2	...	42	27	2	....	Total.	199	576	192	74	4	2,994	5,412	89	45

3. *Detail statement of work done to date.*

	Snags.			Overhanging trees.			Steamboats.	Logs on bank cut.	Piles.	Explosives.
	First class.	Second class.	Third class.	Pulled back.	Cut.					
					Over 8 inches.	Under 8 inches.				
										Lbs.
1882-'92 (Report Chief of Engineers, U. S. Army, 1892)	1,578			4,935			1	......	82	......
1892-'93	1,041			8,406			......	89	......	45
Total	2,619			13,341			1	89	82	45

N 3.

IMPROVEMENT OF SAVANNAH RIVER ABOVE AUGUSTA, GA.

The Savannah River is formed by the junction of the Tugaloo and Keowee rivers, and flows in a southeasterly direction to the sea. Above the city of Augusta the river is navigable only by pole boats.

A detailed description of this river is given in my report of the preliminary examination and survey, printed as House Ex. Doc. No. 23, Fifty-first Congress, first session.

For a special history of past work, see page 1032, Annual Report Chief of Engineers for 1888.

ORIGINAL CONDITION.

The Savannah River above the city of Augusta has a very steep slope, and the obstacles to navigation are not only numerous and extensive, but at places quite dangerous. They consist of rocky ledges, isolated bowlders, and bars of sand and gravel, with minimum low-water depths of less than 1 foot.

PLAN OF IMPROVEMENT.

The plan of improvement, as outlined in my report of January 1, 1890, provides for the establishment between Petersburg and the Locks of a downstream channel, 12 to 25 feet in width, and navigable during ordinary summer low water (or from nine to ten months of each year), for pole boats drawing 2 feet, and of an upstream channel navigable under the same conditions for pole boats drawing 1.3 feet of water.

This is to be obtained by (1) removing logs and overhanging trees; (2) excavating rock, sand, or gravel, and with excavated material raising crests of ledges; (3) constructing training walls to increase flow of water through sluices.

The cost of the improvement is estimated at $23,000, provided the money is made available at once, or at $33,000, if supplied in smaller amounts.

SUMMARY OF OPERATIONS PRIOR TO JULY 1, 1892.

In 1881 work was begun at the rapids near Stevens Creek Falls, about 8 miles above Augusta. Since then operations have been carried on between that point and Ring Jaw, 34 miles above Augusta. The work done consisted in the removal of solid ledges of rock, bowlders, and gravel, and in the construction of wing-dams for contracting the waterway. These dams were built of brush mattresses loaded with riprap stone, and in some instances of stone alone. In the execution of this work there were removed 4,231 cubic yards of rock, chiefly by blasting, 37 cubic yards of loose bowlders, and 62 cubic yards of gravel.

In the construction of the brush wing dams, thers were employed 6,670 square yards of mattresses and 1,726 cubic yards of riprap stone; in the construction of the stone wing dams, 2,458 cubic yards of riprap stone were employed. All work was done by contract.

Up to July 1, 1892, the total expenditures for the work, including all outstanding liabilities, amounted to $38,346.98.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1893.

Under a contract awarded October 24, 1892, to William H. Walsh, work was commenced on October 14 and continued until November 15, when the height of the river rendered further operations impossible. Under the same contract operations were resumed on June 12 and continued to June 26, when the available funds were exhausted. During these two periods there was work done at the following places:

Stevens Creek Falls.—Repairing and extending old dams and building two new ones; aggregate length of new work, 140 feet. Rock excavation in channel, 154.5 cubic yards.

Half Way Ledge.—Repairing and extending old dams; aggregate length of new work, 150 feet. Rock excavation in channel, 39 cubic yards.

Four Miles Reach.—Repairing and extending old dams; aggregate length of new work, 160 feet. Rock excavation in channel, 38.5 cubic yards.

Pine Log Shoals.—Building a new dam 80 feet long. Rock excavation in channel, 47 cubic yards.

Scott Shoals.—Repairing and extending old dam and building two new ones; aggregate length of new work, 280 feet. Rock excavation in channel, 31.5 cubic yards.

Chicken Sluice.—Building three new dams aggregating 400 feet in length. Rock excavation in channel, 31 cubic yards. In this work there were used 2,018.66 cubic yards of fascines, 1,186.30 cubic yards of riprap stone, and 200 pounds of explosives.

Besides the shore work the river banks were cleared from Petersburg, Ga., to The Locks, above Augusta, Ga., a distance of 48 miles.

CONDITION OF WORK JUNE 30, 1893.

The river banks are in good condition from The Locks, above Augusta, Ga., to Petersburg, Ga.

The channel is in good and navigable condition from The Locks, above Augusta, Ga., to Little River Shoals, 17¼ miles above.

COMMERCE AND NAVIGATION.

A detailed statement of the commerce tributary to this river is given in my report on the examination and survey of the river, printed as House Ex. Doc. No. 213, Fifty-first Congress, first session.

The freight carried on the river consists principally of cotton, grain, fertilizers, and general merchandise. Its total value amounted last year to about $350,000, the freight receipts upon which amounted to about $30,000. With an improved pole-boat channel the commerce of the river could be considerably increased, but no work other than that necessary for the benefit of pole-boat navigation is needed.

MISCELLANEOUS.

The work is located in the collection district of Savannah, Ga. Savannah is the nearest port of entry. Amount of duties collected in 1892, $47,687. Forts Oglethorpe and Pulaski are the nearest forts, and the nearest light-houses are those upon the river below Savannah.

Since the existing project for improving this portion of Savannah River was adopted one appropriation of $10,000 has been made, by act of Congress approved July 13, 1892.

The total expenditures under the present project up to June 30, 189 including all outstanding liabilities, amounted to $9,956.64.

It is proposed to expend any funds which may become available du-ing the year in removing ledges of rock and gravel and in constructi closure dams and training walls to increase the flow of water throu the sluices.

The sum of $23,000 can be advantageously and economically e-pended during the coming year.

Money statement.

Amount appropriated by act approved July 13, 1892	$10,000
June 30, 1893, amount expended during fiscal year	5,21
July 1, 1893, balance unexpended	4,18
July 1, 1893, outstanding liabilities	4,13
July 1, 1893, balance available	43
Amount (estimated) required for completion of existing project	23,0
Amount that can be profitably expended in fiscal year ending June 30, 1895	23,0

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and sundry civil act of March 3, 1893.

Abstract of proposals for improving Savannah River, Georgia, above Augusta, opened Se tember 19, 1892, by Capt. O. M. Carter, Corps of Engineers.

No.	Name and address of bidder.	Rock excavation (1,000 cubic yards).		Fascines (1,500 cubic yards).		Riprap stone (1,000 cubic yards).		Clearing river banks (20 miles).		To
		Price.	Amount.	Price.	Amount.	Price.	Amount.	Price.	Amount.	
1	Marion Applegate, Haysville, Pa.	$4.60	$4,600.00	$1.60	$2,400.00	$2.45	$2,450.00	$65.00	$1,300.00	$10,
2	William H. Walsh, Fernandina, Fla.*	4.25	4,250.00	1.50	2,250.00	2.75	2,750.00	35.00	700.00	9
3	Albert J. Twiggs, Augusta, Ga.	5.00	5,000.00	1.25	1,875.00	3.50	3,500.00	50.00	1,000.00	11

* Bid recommended for acceptance, he being the lowest responsible bidder for the best and m suitable material and service.

Amount available $10,000.

N 4.

IMPROVEMENT OF DARIEN HARBOR, GEORGIA.

About 12 miles above the town of Darien the Altamaha Riv divides into several branches. The northerly main branch forms t Darien River. That portion of Darien River between Darien a Doboy Sound is known as Darien Harbor.

Operations for improving this harbor have been carried on in a-cordance with a project of improvement submitted to the Chief of E-gineers by Gen. Gillmore, the officer then in charge, dated Janua 30, 1885, and printed as Appendix N 16, Annual Report of the Chi of Engineers for 1885.

ORIGINAL CONDITION.

Darien Harbor is at seven points and, covering a total distance o 9.7 miles, more or less obstructed by shoals with minimum low-wat depths on them of from 6.3 to 10.6 feet. The reaches between these shoals have nowhere less than 12 feet depth at mean low water. The mean rise and fall of tide in the river is about 6.5 feet.

PLAN OF IMPROVEMENT.

The plan of improvement contemplates the establishment of a navigable channel between Darien and Doboy with a minimum low-water depth of 12 feet. This is to be accomplished by dredging to a minimum depth of 12.5 feet and by the construction of wing dams at five of the shoals for maintaining the depth of the improved channel.

The estimated cost of the improvement is $170,000.

SUMMARY OF OPERATIONS PRIOR TO JULY 1, 1892.

Five of the shoals at Darien Harbor were temporarily improved by dredging, in 1879, by means of an appropriation of $8,000 made by act of Congress approved June 18, 1878.

The first work under the present project was done under a contract for dredging executed on May 5, 1891, with Mr. P. Sanford Ross. Work was begun on June 11, 1891, and continued until November 13, 1891, when the funds available for the work were exhausted. There were removed from the various shoals 86,640.20 cubic yards of material.

Up to July 1, 1892, the total expenditures for the work, including outstanding liabilities, amounted to $24,321.97.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1893.

Under a contract for the construction of spur dams, awarded on December 20, 1892, to the Atlantic Contracting Company, of New York, jetty work was commenced on March 14 and continued until June 10, when the funds available for the work were exhausted.

Of the 24 spurs contemplated by the project for the improvement of the upper river, there were constructed during the year 20, consisting each of two rows of piles filled with brush fascines and strengthened by timber waling, cross and back ties, and, where required, by groups of tie piles and clusters of fender piles. The aggregate length of the spur dams is 4,172.6 feet, and there were used in their construction 1,075 piles, 15,068.35 cubic yards of brush fascines, 59,290.25 feet, B. M., of 6 by 10 inches sawn timber, and 6,094.46 pounds of iron bolts. Aside from the pile work of the spur dams proper, there were driven 4 groups of tie piles and 39 clusters of fender piles, so that the entire number of piles driven was 1,200.

CONDITION OF WORK JUNE 30, 1893.

Pico Cut.—The 2 spur dams at this place have been completed and are in good condition. The least mean low-water channel depth at this place is about 10½ feet.

North and South Reach (*Shoal No. 3*).—The 6 spur dams at this place have been completed and are in good condition. The 9-foot mean low-water curve is continuous across the shoal, although very narrow at one place.

Long Reach (*Shoal No. 2*).—The 8 spur dams at this place have been completed and are in good condition. The 9-foot mean low-water curve is continuous across the shoal, the least practicable channel depth being about 11 feet.

Long Reach (*Shoal No. 1 1–2*).—Of the 8 spur dams designed for this place 4 have been completed and are in good condition. The 9-foot mean low-water curve is continuous across the shoal and the least practicable channel depth is about 10½ feet.

COMMERCE AND NAVIGATION.

The commerce of Darien is entirely dependent upon water carriage. It consists principally of shipments of lumber, timber, naval stores, and rice, which are brought down the Altamaha from the region bordering that river and its tributaries. But little cotton seeks an outlet at this port. The total annual trade amounts to about 125,000 tons, valued at $1,500,000, the freight on which is about $600,000.

The outlet of Darien Harbor is by way of Doboy and Doboy Bar, but the shoaling of the latter renders the entrance of deep-draft vessels impossible, and much of the timber that would otherwise be shipped from Darien is now rafted to Sapelo and St. Simons, at an increased cost of about 25 cents per 1,000 feet. These shipments, amounting annually to about 20,000,000 feet, are not included in the Darien exports, although it all passes through the harbor.

There is also a large number of small sailing craft carrying rice, fish, vegetables, etc., plying on the inland waters around Darien, and on the inland route there are two steamers per week to Savannah, one per week up the Altamaha River, and the Empire Mills Company has a steamer running regularly to Brooklyn, N. Y., carrying lumber, returning with cargoes of general merchandise.

MISCELLANEOUS.

The work is situated in the collection district of Brunswick, Ga. Darien is the nearest port of entry. Amount of duties collected at Brunswick in 1892, $6,408; at Darien, none. Sapelo Light is the nearest light-house and forts Oglethorpe and Pulaski are the nearest forts.

Since the existing project for improving Darien Harbor was adopted the following appropriations have been made for this work:

By act of Congress of—	
September 19, 1890	$25,0
July 13, 1892	25,0
Total	50,0

The total expenditures under the present project of improvement to June 30, 1893, including all outstanding liabilities, were $49,546.68.

It is proposed to expend the funds on hand and any that may become available during the year in the removal of the shoals by dredging and in the construction of works of contraction in accordance with the existing project.

The sum of $120,000 can be economically and advantageously expended during the coming year.

Money statement.

July 1, 1892, balance unexpended	$733.8
Amount appropriated by act approved July 13, 1892	25,000.0
	25,733.8
June 30, 1893, amount expended during fiscal year	25,175.9
July 1, 1893, balance unexpended	557.4
July 1, 1893, outstanding liabilities	104.2
July 1, 1893, balance available	453.2

Amount (estimated) required for completion of existing project.......$120,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895 120,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for improving harbor at Darien, Ga., opened on November 29, 1892, by Capt. O. M. Carter, Corps of Engineers.

No.	Name and address of bidder.	Fascines (10,000 cubic yards).		Pile work (2,500 feet).		Fender piles (10 clusters).	
		Price.	*Amount.*	*Price.*	*Amount.*	*Price.*	*Amount.*
1	Colin McK. Grant, Charleston, S. C..	$1.25	$12,500.00	$2.85	$4,125.00	$35.00	$350.00
2	The Atlantic Contracting Co., John F. Gaynor, president, New York, N. Y.*........................	.89	8,900.00	1.40	3,500.00	50.00	500.00

No.	Name and address of bidder.	Sawn timber (25,000 feet).		Iron bolts (4,000 pounds).		Riprap stone (1,000 cubic yards).*		Total.
		Price.	*Am'nt.*	*Price.*	*Am'nt.*	*Price.*	*Amount.*	
1	Colin McK. Grant, Charleston, S. C..	$36.00	$900.00	$0.07	$280.00	$2.50	$2,500.00	$23,655.00
2	The Atlantic Contracting Co., John F. Gaynor, president, New York, N. Y.*........................	25.00	625.00	.09	360.00	1.30	1,300.00	15,185.00

* Bid recommended for acceptance, they being the lowest responsible bidders for the best and most suitable materials and services.

Amount available, $22,500.

COMMERCIAL STATISTICS

Arrivals and clearances of vessels at Darien, Ga., from January 1, 1875, to December 31, 1892.

ARRIVED.

Year.	Coastwise.			Foreign ports.						Total.			Greatest draft.
				American vessels.			Foreign vessel.						
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	
													Ft.
1875........	77	28,053	647	....	....	....	92	47,600	1,198	169	75,663	1,845	22
1876........	65	23,105	611	....	....	....	124	70,368	1,897	189	93,473	2,508	21
1877........	104	24,827	1,257	3	674	22	99	50,913	1,231	206	106,414	2,510	20
1878........	61	29,264	641	2	1,051	20	126	60,109	1,628	189	90,424	2,289	20
1879........	58	23,275	487	3	4,199	25	115	57,710	1,407	176	82,184	1,919	19½
1880........	66	21,539	489	1	688	13	134	68,072	1,608	201	90,270	2,140	19½
1881........	101	40,619	849	3	1,220	29	162	84,457	1,991	166	126,295	2,869	19½
1882........	117	48,208	999	1	455	9	90	51,421	1,155	208	100,082	2,163	19
1883........	95	38,173	815	....	....	....	93	49,290	1,135	188	87,963	1,950	19
1884........	81	34,412	714	2	606	16	92	50,178	1,133	175	85,193	1,863	19
1885........	78	27,763	691	2	652	16	80	42,587	975	160	71,002	1,673	18½
1886........	108	44,389	852	....	....	....	42	20,772	483	150	65,161	1,335	19
1887........	127	57,035	1,059	5	2,349	45	26	13,023	298	158	72,407	1,402	....
1888........	185	76,645	1,558	1	402	9	22	13.423	273	208	91,470	1,840	18½
1889........	145	69,763	1.341	7	4,349	62	61	19,837	453	213	93,949	1,856	13½
1890........	169	58,058	1,158	5	1,964	41	28	1,086	308	202	61,108	1,507	18½
1891........	137	56,818	1,124	6	2,377	46	24	17,853	308,	167	77,048	1,478	....
1892........	168	69,627	1,369	1	353	7	25	17,446	334	194	87,426	1,710	18½

Arrivals and clearances of vessels at Darien, Ga., etc.—Continued.

CLEARED.

Year.	Coastwise.			Foreign ports.						Total.			Greatest draft.
				American vessels.			Foreign vessels.						
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	Ft.
1875	22	12, 214	328	11	4, 055	97	104	55, 759	1, 372	137	72, 028	1, 797	22
1876	39	9, 300	270	4	1, 553	32	180	87, 489	2, 263	223	98, 342	2, 565	21
1877	44	13, 209	314	4	842	21	169	92, 795	2, 154	217	106, 846	2, 489	20
1878	28	7, 842	181	6	3, 000	62	149	83, 385	1, 947	183	94, 236	2, 190	20
1879	40	14, 052	301	7	2, 765	57	125	65, 433	1, 538	172	82, 250	1, 896	19½
1880	55	17, 076	393	7	3, 589	72	168	84, 172	2, 016	230	104, 837	2, 481	19½
1881	80	28, 492	617	8	3, 120	70	184	95, 353	2, 164	272	126, 965	2, 851	19½
1882	93	34, 098	709	6	1, 902	46	115	63, 525	1, 434	214	99, 585	2, 189	19
1883	66	25, 019	510	9	3, 533	72	108	56, 411	1, 340	183	84, 903	1, 931	19
1884	59	20, 637	457	11	3, 977	85	119	66, 337	1, 478	189	90, 951	2, 020	19
1885	46	16, 649	339	8	3, 354	62	98	52, 742	1, 198	152	72, 745	1, 599	15½
1886	93	38, 295	719	10	3, 682	80	50	24, 376	564	153	66, 358	1, 363	19
1887	126	55, 592	1, 016	12	1, 144	17	16	8, 612	189	144	65, 700	1, 222	....
1888	155	64, 749	1, 318	2	538	15	36	23, 742	453	193	89, 029	1, 786	19
1889	155	63, 347	2, 091	6	4, 333	66	46	26, 488	528	207	94, 168	2, 685	....
1890	171	58, 810	1, 174	3	962	23	31	15, 569	336	205	75, 351	1, 533	....
1891	127	53, 890	1, 031	3	896	20	26	18, 006	256	156	72, 792	379	....
1892	161	69, 488	1, 310	2	917	16	33	21, 502	418	196	91, 807	1, 744	....

Timber shipments from port of Darien, Ga., from January 1, 1875, to December 31, 1892.

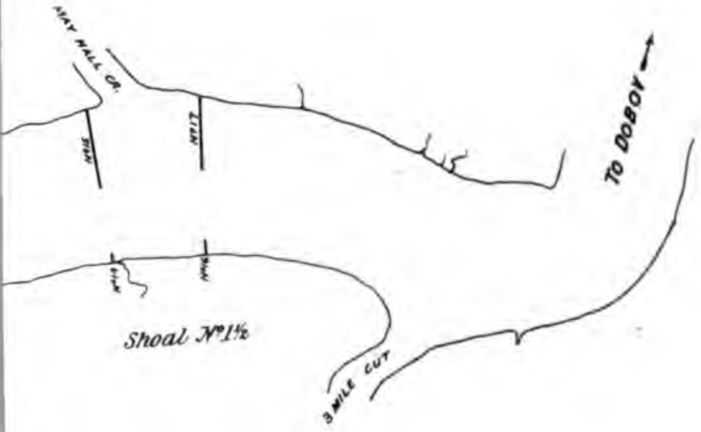
Year.	Foreign.		Coastwise.		Total.	
	Superficial feet.	Value.	Superficial feet.	Value.	Superficial feet.	Value.
1875	41, 447, 024	$557, 524	10, 992, 600	$181, 377. 00	52, 439, 624	$738, 901. 00
1876	60, 762, 000	735, 099	8, 370, 000	138, 105. 00	69, 132, 000	873, 204. 00
1877	64, 378, 000	776, 856	11, 888, 100	196, 153. 65	76, 266, 100	973, 009. 65
1878	59, 697, 124	716, 365	7, 057, 800	116, 453. 70	66, 754, 924	832, 818. 70
1879	47, 217, 818	566, 613	12, 646, 800	208, 672. 20	59, 804, 618	775, 285. 20
1880	74, 612, 520	895, 350	15, 368, 500	253, 578. 60	89, 981, 020	1, 148, 928. 60
1881	65, 420, 876	785, 050	25, 642, 800	423, 106. 20	91, 063, 676	1, 208, 156. 20
1882	36, 639, 379	439, 672	30, 688, 200	506, 355. 30	67, 327, 579	946, 027. 30
1883	42, 385, 000	508, 620	22, 517, 100	371, 532. 15	64, 902, 100	880, 152. 15
1884	50, 656, 000	607, 872	18, 573, 300	306, 459. 45	69, 229, 300	914, 331. 45
1885	40, 101, 000	501, 262	14, 984, 100	247, 937. 65	55, 085, 100	749, 199. 65
1886	19, 960, 000	219, 500	24, 465, 000	661, 440. 00	54, 425, 000	870, 940. 00
1887	12, 023, 611	138, 476	50, 349, 600	912, 220. 00	62, 373, 211	1, 056, 960. 00
1888	17, 975, 371	215, 705	65, 998, 200	1, 121, 960. 00	83, 975, 571	1, 337, 665. 00
1889	20, 772, 265	237, 652	50, 667, 660	760, 144. 00	71, 449, 865	997, 816. 00
1890	10, 962, 017	140, 746	68, 223, 683	949, 762. 00	79, 185, 700	1, 090, 508. 00
1891	13, 785, 333	274, 674	45, 519, 707	910, 718. 10	59, 305, 040	1, 185, 391. 80
1892	12, 893, 730	179, 616	49, 708, 879	1, 093, 595. 00	62, 602, 609	1, 273, 211. 00

Commerce.

Year.	Value of exports.	Value of imports.	Total collections.
1880	$1, 621, 904	$5, 600	$11, 806. 72
1881	1, 137. 490	3, 356	18, 981. 02
1882	1, 073, 008	1, 025	11, 254. 19
1883	969. 834	2, 334	11, 067. 27
1884	1, 038, 185	11	9, 688. 10
1885	860, 500	....	2, 356. 01
1886	1, 037, 330	....	....
1887	1, 221, 000	....	....
1888	2, 100, 000	2, 600	964. 13
1889	997, 816	None.	None.
1890	140, 746	None.	None.
1891	1, 530, 000	None.	None.
1892	1, 452, 827	None.	None.

C. LAWTON,
Deputy Collector, Darien, Georgia.

Sheet 1



U. S. Engineer Office
Savannah. Ga. July 1st 1893
To accompany annual report
OMCarter
Capt. Corps of Engrs. U.S.A.

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Arrivals and clearances of vessels at Darien, Ga., etc.—Continued.

CLEARED.

Year.	Coastwise.			Foreign ports.						Total.		
				American vessels.			Foreign vessels.					
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.
1875	22	12, 214	328	11	4, 055	97	104	55, 759	1, 372	137	72, 028	1, 797
1876	39	9, 300	270	4	1, 553	32	180	87, 489	2, 263	223	98, 342	2, 565
1877	44	13, 209	314	4	842	21	169	92, 795	2, 154	217	106, 846	2, 489
1878	28	7, 842	181	6	3, 000	62	149	83, 385	1, 947	183	94, 236	2, 190
1879	40	14, 052	301	7	2, 765	57	125	65, 433	1, 538	172	82, 250	1, 896
1880	55	17, 076	393	7	3, 589	72	168	84, 172	2, 016	230	194, 837	2, 481
1881	80	28, 492	617	8	3, 120	70	184	95, 358	2, 164	272	126, 965	2, 851
1882	93	34, 098	709	6	1, 962	46	115	63, 525	1, 434	214	99, 585	2, 189
1883	66	25, 019	510	9	3, 533	72	108	56, 411	1, 340	183	84, 963	1, 931
1884	59	20, 637	457	11	3, 977	85	119	66. 337	1, 478	189	90, 951	2, 020
1885	46	16, 649	339	8	3, 354	62	98	52, 742	1, 198	152	72, 745	1, 599
1886	93	38, 295	719	10	3, 682	80	50	24, 376	564	153	66, 358	1, 363
1887	126	55, 592	1, 016	12	1, 144	17	16	8, 612	189	144	65, 700	1, 222
1888	155	64, 749	1, 318	2	538	15	36	23, 742	453	193	89, 029	1, 786
1889	155	63, 347	2, 091	6	4, 333	66	46	26, 488	528	207	94, 168	2, 685
1890	171	58, 810	1, 174	3	962	23	31	15, 569	336	205	75, 351	1, 533
1891	127	53, 890	1, 031	3	896	20	26	18, 006	256	156	72, 792	379
1892	161	69, 488	1, 310	2	917	16	33	21, 502	418	196	91, 807	1, 744

Timber shipments from port of Darien, Ga., from January 1, 1875, to December 31, 18

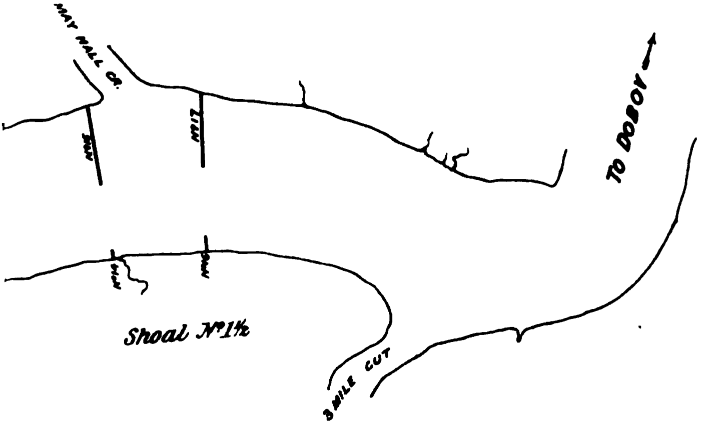
Year.	Foreign.		Coastwise.		Total.	
	Superficial feet.	Value.	Superficial feet.	Value.	Superficial feet.	Value.
1875	41, 447, 024	$557, 524	10, 992, 600	$181, 377. 00	52, 439, 624	$738, 90
1876	60, 762, 000	735, 099	8, 370, 000	138, 105. 00	69, 132, 000	873, 20
1877	64, 378, 000	776, 856	11, 888, 100	196, 153. 65	76, 266, 100	973, 0
1878	59, 697, 124	716, 365	7, 057, 800	116, 453. 70	66, 754, 924	832, 81
1879	47, 217, 818	566, 613	12, 646, 800	208, 672. 20	59, 804, 618	775, 2
1880	74, 612, 520	895, 350	15, 368, 500	253, 578. 60	89, 981, 020	1, 148, 9
1881	65, 420, 876	785, 050	25, 642, 800	423, 106. 20	91, 063, 676	1, 208, 15
1882	36, 639, 379	439, 672	30, 688, 200	506, 355. 30	67, 327, 579	946, 0
1883	42, 385, 000	508, 620	22, 517, 100	371, 532. 15	64, 902, 100	880, 15
1884	50, 656, 000.	607, 872	18, 573, 300	306, 459. 45	69, 229, 300	914, 3
1885	40, 101, 000	501, 262	14, 984, 100	247, 937. 65	55, 085, 100	749, 19
1886	19, 960, 000	219, 500	24, 465, 000	661, 440. 00	54, 425, 000	870, 94
1887	12, 023, 611	138, 476	50, 349, 600	912, 220. 00	62, 373, 211	1, 056, 96
1888	17, 975, 371	215, 705	65, 998, 200	1, 121, 960. 00	83, 975, 571	1, 337, 66
1889	20, 772, 265	237, 652	50, 667, 660	760, 144. 00	71, 449, 865	997, 81
1890	10, 962. 017	140, 746	68, 223, 683	949, 762. 00	79, 185, 700	1, 090, 5
1891	13, 785, 333	274, 674	45, 519, 707	·910, 718. 10	59, 305, 040	1, 185, 39
1892	12, 893, 730	179, 616	49, 708, 879	1, 093, 505. 00	62, 602, 609	1, 273, 21

Commerce.

Year.	Value of exports.	Value of imports.	Total collections.
1880	$1, 621, 904	$5, 600	$11, 80
1881	1, 137, 490	3, 356	18, 98
1882	1, 073, 008	1, 025	11, 254
1883	969. 834	2, 334	11, 06
1884	1, 038, 185	11	9, 6
1885	860, 500	....	2, 35
1886	1, 037, 330	....	....
1887	1, 221, 000	....	....
1888	2, 100, 000	2, 600	964
1889	997, 816	None.	None.
1890	140, 746	None.	None.
1891	1, 530, 000	None.	None.
1892	1, 452, 827	None.	None.

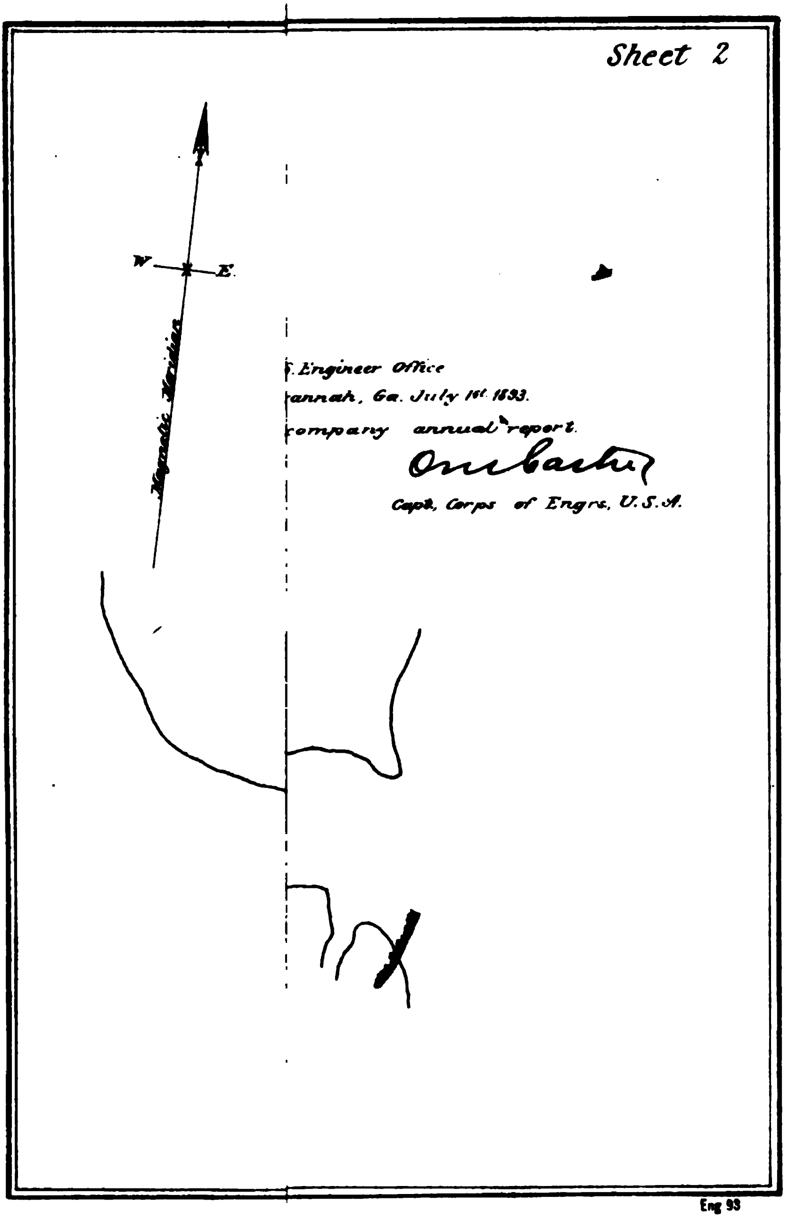
C. LAWTON,
Deputy Collector, Darien, Georgia.

Sheet 1



U. S. Engineer Office
Savannah. Ga. July 1st 1893
To accompany annual report

O M Carter
Capt. Corps of Engrs., U. S. A.



Sheet 2

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company annual report.
O M Carter
Capt., Corps of Engrs. U.S.A.

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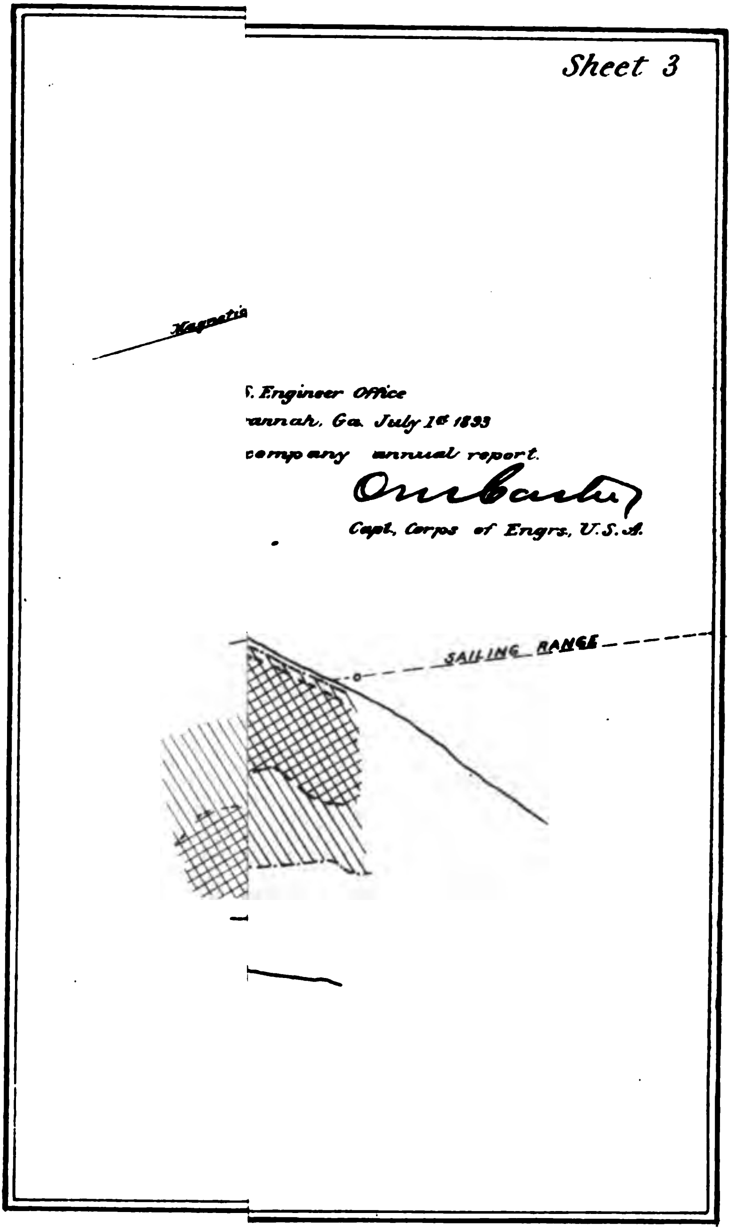
Sheet 3



. Engineer Office
annah, Ga. July 1st 1893
company annual report.

OMCarter
Capt., Corps of Engrs., U.S.A.

Arrivals and clearances of vessels at Darien, Ga., etc.—Continued.

CLEARED.

Year.	Coastwise.			Foreign ports.						Total.		
				American vessels.			Foreign vessels.					
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	C
1875	22	12, 214	328	11	4, 055	97	104	55, 759	1, 372	137	72, 028	1
1876	39	9, 300	270	4	1, 553	32	180	87, 489	2, 263	223	98, 342	2
1877	44	13, 209	314	4	842	21	169	92, 795	2, 154	217	106, 846	2
1878	28	7, 842	181	6	3, 000	62	149	83, 385	1, 947	183	94, 236	2
1879	40	14, 052	301	7	2, 765	57	125	65, 433	1, 538	172	82, 250	1
1880	55	17, 076	393	7	3, 589	72	168	84, 172	2, 016	230	194, 837	2
1881	80	28, 492	617	8	3, 120	70	184	95, 353	2, 164	272	126, 965	2
1882	93	34, 098	709	6	1, 962	46	115	63, 525	1, 434	214	99, 585	2
1883	66	25, 019	510	9	3, 533	72	108	56, 411	1, 340	183	84, 963	1
1884	59	20, 637	457	11	3, 977	85	119	66, 337	1, 478	189	90, 951	2
1885	46	16, 649	339	8	3, 354	62	98	52, 742	1, 198	152	72, 745	1
1886	93	38, 295	719	10	3, 682	80	50	24, 376	564	153	66, 358	1
1887	126	55, 592	1, 016	12	1, 144	17	16	8, 612	189	144	65, 700	1
1888	155	64, 749	1, 318	2	538	15	36	23, 742	453	193	89, 029	1
1889	155	63, 347	2, 091	6	4, 333	66	46	26, 488	528	207	94, 168	2
1890	171	58, 810	1, 174	3	962	23	31	15, 569	336	205	75, 351	1
1891	127	53, 890	1, 031	3	896	20	26	18, 006	256	156	72, 792	
1892	161	69, 488	1, 310	2	917	16	33	21, 502	418	196	91, 807	1,

Timber shipments from port of Darien, Ga., from January 1, 1875, to December 31

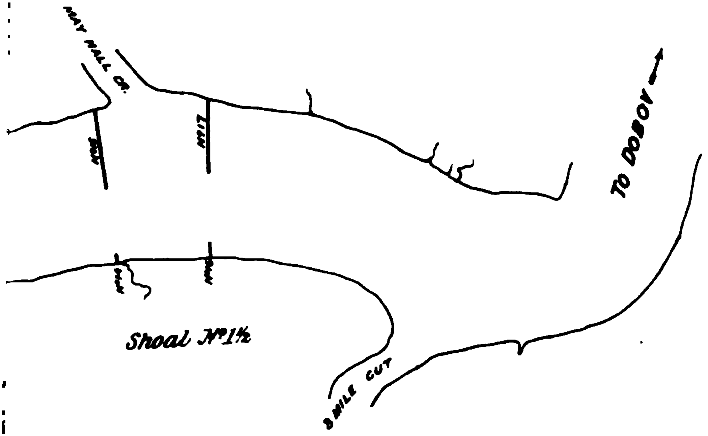
Year.	Foreign.		Coastwise.		Total.	
	Superficial feet.	Value.	Superficial feet.	Value.	Superficial feet.	V
1875	41, 447, 024	$557, 524	10, 992, 600	$181, 377. 00	52, 439, 624	$73
1876	60, 762, 000	735, 099	8, 370, 000	138, 105. 00	69, 132, 000	87
1877	64, 378, 000	776, 856	11, 888, 100	196, 153. 65	76, 266, 100	97
1878	59, 697, 124	716, 365	7, 057, 800	116, 453. 70	66, 754, 924	83
1879	47, 217, 818	566, 613	12, 646, 800	208, 672. 20	59, 804, 618	77
1880	74, 612, 520	895, 350	15, 368, 500	253, 578. 60	89, 981, 020	1, 14
1881	65, 420, 876	785, 050	25, 642, 800	423, 106. 20	91, 063, 676	1, 20
1882	36, 639, 379	439, 672	30, 688, 200	506, 355. 30	67, 327, 579	94
1883	42, 385, 000	508, 620	22, 517, 100	371, 532. 15	64, 902, 100	88
1884	50, 656, 000.	607, 872	18, 573, 300	306, 459. 45	69, 229, 300	91
1885	40, 101, 000	501, 262	14, 984, 100	247, 937. 65	55, 085, 100	74
1886	19, 960, 000	219, 500	24, 465, 000	661, 440. 00	54, 425, 000	87
1887	12, 023, 611	138, 476	50, 349, 600	912, 220. 00	62, 373, 211	1, 05
1888	17, 975, 371	215, 705	65, 998, 200	1, 121, 960. 00	83, 975, 571	1, 33
1889	20, 772, 265	237, 652	50, 667, 660	760, 144. 00	71. 449, 865	99
1890	10, 962. 017	140, 746	68, 223, 683	949, 762. 00	79, 185, 700	1, 09
1891	13, 785, 333	274, 674	45, 519, 707	910, 718. 10	59, 305, 040	1, 18
1892	12, 893, 730	179, 616	49, 708, 879	1, 093, 595. 00	62, 602, 609	1, 27

Commerce.

Year.	Value of exports.	Value of imports.	Tot lec
1880	$1, 621, 904	$5, 600	$11,
1881	1, 137, 490	3, 356	18,
1882	1, 073, 008	1, 025	11,
1883	969. 834	2, 334	11,
1884	1, 038, 185	11	9,
1885	860, 500	....	2,
1886	1, 037, 330	....	.....
1887	1, 221, 000	....	.....
1888	2, 100, 000	2, 600	
1889	997. 816	None.	
1890	140, 746	None.	
1891	1, 530, 000	None.	
1892	1, 452, 827	None.	

C. LAWTON.
Deputy Collector, Darien, Geor

Sheet 1



U. S. Engineer Office
Savannah. Ga. July 1st 1893
To accompany annual report
O. M. Carter
Capt. Corps of Engrs, U.S.A.

N 5.

IMPROVEMENT OF ALTAMAHA RIVER, GEORGIA.

The Altamaha River is formed by the junction of the Oconee and Ocmulgee rivers, in the southeastern part of Georgia, and flows in a southeasterly direction to the sea.

A detailed description of this river is given in my report of a survey dated June 12, 1890, which is printed as part of Appendix O 5, Annual Report of the Chief of Engineers for 1890, pp. 1372–1386.

For a special history of past work, see p. 1038, Annual Report of the Chief of Engineers for 1888 and the Annual Reports of the same officer since that date.

ORIGINAL CONDITION.

The chief obstruction to the navigation of the Altamaha River consists in rock ledges, sand bars, overhanging trees, snags, and sunken logs. The rock ledges were confined to the upper portion of the stream, while the other obstructions were found throughout its entire course. The low-water depths at some points did not exceed 1 foot.

PLAN OF IMPROVEMENT.

The plan of improvement outlined in my report of June 12, 1890, provides for the establishment of a navigable steamboat channel, 3 feet deep at ordinary summer low water, between the junction of the Oconee and Ocmulgee rivers and the town of Darien.

This is to be accomplished by (1) removing rock shoals and sand bars; (2) building deflecting dikes and closing incipient cut-offs; (3) removing snags and logs from the channel and overhanging trees from the banks of the stream; (4) revetting caving banks.

The cost of the improvement is estimated in round numbers at $129,000, provided funds are regularly and adequately supplied.

SUMMARY OF OPERATIONS PRIOR TO JULY 1, 1892.

The first appropriation ($5,000) ever made for the Altamaha was expended on a snag boat, which was built for use upon this river and the Savannah. This boat began to work upon the river on Octobor 1, 1883, and has been employed at intervals since that date, regular work having been impossible on account of the insufficiency of funds. She was thoroughly repaired in 1889. Operations have been carried on between Darien and the junction of the Oconee and Ocmulgee rivers. There have been removed in all 2 piles, 1,777 snags and logs, and 3,639 overhanging trees; 24 logs were cut upon bank, 5 trees were deadened, and 4 trees pulled back.

In 1883, channels 100 feet in width and 4 feet in depth at ordinary low water were opened through the rock ledges at Town Bluff and Piney Bluff by the removal of 319 and 1,480 cubic yards of rock at these points, respectively.

In 1884–'85 a training wall was built at Beards Bluff for the improvement of a shoal at that locality, and shore protection was constructed for the protection of caving banks. In the execution of this work 811.2 cubic yards of stone, 428.44 cubic yards of gravel, and 3,545.38 cubic yards of brush fascines were used.

The steam hoister, rigged as a pile-driver, began work October [illegible], 1891, at Beards Bluff, in the construction of wattled pile spur dams and in repairing the old training wall for the improvement of the sand bar at that point. Operations were suspended at the end of January, 1892, owing to high water, but were resumed May 5 and were in progress at the end of the fiscal year, the work being nearly completed. In this work 239 piles have been driven, 1,914 linear feet of piling have been wattled with poles, 1,231 linear feet of brush mattresses, 18 feet wide, have been sunk and covered with 141 cubic yards of stone, and the banks at the ends of the ten dams constructed have been cut down and protected with brush and stone.

All work, with the exception of that done by the snag boat and the steam-hoister, was done by contract.

Up to July 1, 1892, the total expenditures for this work, including all outstanding liabilities, amounted to $73,145.70.

The total expenditure under the present project up to July 1, 1892, including all outstanding liabilities, was $8,369.11.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1893.

Jetty work under the contract awarded December 20, 1892, to the Atlantic Contracting Company, was commenced at Couper Bar on February 20th and continued until April 29th, when the funds available for this work were exhausted.

There were constructed on the west shore spurs No. 1, 51.5 feet long; No. 2, 132.5 feet long; No. 3, 194 feet long; and on the east shore the training wall, 554 feet long. Both training wall and spur dams consist of double rows of piles driven 8 feet apart, filled with fascines and strengthened by timber waling, cross and back ties, and, where required, by groups of tie piles and clusters of fender piles. There were used for the construction of the three spurs 324 piles, 2,1[illegible] cubic yards of fascines, 51.37 cubic yards of riprap stone, 7,471.00 feet B. M., of 6 by 10 inch timber and 771.40 pounds of iron bolts. Aside from the pile work of the spur dams proper there were driven 21 groups of tie piles and 4 clusters of fender piles, so that the entire number of piles driven on the spurs was 378.

There were used in the construction of the training wall 147 piles, 2,243.57 cubic yards of fascines, 90.14 cubic yards of riprap stone, 5,031.25 feet, B. M., of 6 by 10 inch timber and 514 pounds of iron bolts. Aside from the pile work of the training wall proper there were driven 5 groups of tie piles and 7 clusters of fender piles, so that the entire number of piles driven on the training wall was 178.

The steam-hoister, rigged as a pile-driver, continued work on the river until October 25, 1892, when she was sent to Savannah for repairs. There were driven 12 piles in repairing old work at Beards Bluff. There were constructed at Marrow Bone Bar 12 new spur dams of an aggregate length of 1,015 feet and 6 closing dams of an aggregate length of 237 feet, in the construction of which there were driven 231 piles. There were put into this work 1,630 cubic yards of brush mattresses, loaded with 230 cubic yards of riprap stone, and 1,252 linear feet of wattling. There were also constructed at Marrow Bone Bar 79 linear feet of shore protection.

The snag boat *Toccoa* commenced work on the river on June 20th and continued to the end of the fiscal year. During this time there were removed from the channel 24 snags and stumps, and 1,305 overhang-

Commercial statistics, Altamaha River, Georgia, 1892–'93.

Articles.	Tons.	Value.	Articles.	Tons.	Va
Timber	171,000	$684,000	Fertilizers	692	[illegible]
Rosin	14,280	142,800	Corn	375	[illegible]
Turpentine	4,750	237,500	Cotton seed	220	[illegible]
Cotton	745	130,375	Passengers	263	[illegible]
Staves	250	15,000			
Merchandise	2,346	351,900	Total	194,921	1,[illegible]

List of steamboats plying the Altamaha River, 1892–'93.

Name.	Draft, light.	Tonnage, registered.	Terminal points.
	Inches.		
Americus	24	229.85	Doctortown and Darien, Ga.
Altamaha	17	219.27	Doctortown.
Swan	18	360.00	Doboy and Brunswick, Ga.

MISCELLANEOUS.

The work is located in the collection district of Brunswick, Ga. Amount of d[illegible] collected in 1892, $6,408.15. Sapelo Light is the nearest light-house and forts [illegible]thorpe and Pulaski are the nearest forts.

Since the existing project for improving Altamaha River was adop[illegible] the following appropriations have been made for this work:

By act of Congress of—	
August 11, 1888 (unexpended balance)	$[illegible]
September 19, 1890	15,[illegible]
July 13, 1892	15,[illegible]
Total	30,[illegible]

The total expenditures under the present project to June 30, 1[illegible], including all outstanding liabilities, were $26,406.64.

It is proposed to expend the funds on hand and any that may be[illegible] available during the present fiscal year in the removal of obstruc[illegible] and in the improvement of the shoal places in the river, according t[illegible] revised project of 1890.

The sum of $50,000 can be economically and advantageously exp[illegible]ed during the coming year. No permanent improvement can be effe[illegible], as new obstructions, caused by logs and snags, form during every fre[illegible] stage. They should, however, diminish in number from year to [illegible]. From $3,000 to $5,000 will be required for the annual maintenan[illegible] the completed work. The work of removing obstructions has be[illegible] under the local charge of Mr. R. S. Burnett, assistant engineer, w[illegible] report is appended hereto.

Money statement.

July 1, 1892, balance unexpended	$7,1[illegible]
Amount appropriated by act approved July 13, 1892	15,0[illegible]
	22,1[illegible]
June 30, 1893, amount expended during fiscal year	17,[illegible]
July 1, 1893, balance unexpended	4,[illegible]
July 1, 1893, outstanding liabilities	[illegible]
July 1, 1893, balance available	3,[illegible]
Amount (estimated) required for completion of existing project	99,[illegible]
Amount that can be profitably expended in fiscal year ending June 30, 1895	50,[illegible]

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for improving Altamaha River, Georgia, opened on November 19, 1892, by Capt. O. M. Carter, Corps of Engineers.

No.	Name and address of bidder.	Fascines (4,000 cubic yards).		Pile work (600 linear feet).		Fender piles (5 clusters).	
		Price.	Amount.	Price.	Amount.	Price.	Amount.
1	Colin McK. Grant, Charleston, S. C.	$1.45	$5,800.00	$3.20	$1,920.00	$50.00	$250.00
2	*The Atlantic Contracting Co., New York, N. Y. (John F. Gaynor, president)	1.50	6,000.00	3.35	1,950.00	50.00	250.00

No.	Name and address of bidder.	Sawn timber (5,000 feet BM).		Iron bolts (1,000 pounds).		Riprap stone (300 cubic yards).		Total.
		Price.	Am'nt.	Price.	Am'nt.	Price.	Am'nt.	
1	Colin McK. Grant, Charleston, S. C.	$40.00	$200.00	$0.09	$90.00	$3.20	$960.00	$9,220 00
2	*The Atlantic Contracting Co., New York, N. Y. (John F. Gaynor president)	40.00	200.00	0.09	90.00	2.00	600.00	9,090.00

*Bid recommended for acceptance, they being the lowest responsible bidders for the best and most suitable material and services.

Amount available $10,000.

REPORT OF MR. R. S. BURNETT, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Savannah, Ga., July 3, 1893.

CAPTAIN: I respectfully submit the following report on the improvement of the Altamaha River, Georgia, for the fiscal year ending June 30, 1893.

Marrowbone Bar.—Work was continued on this bar by the steam-hoister and pile-driver constructing deflecting jetties by hired labor and the purchase of material in open market. Twelve jetties were constructed and six sloughs closed with pile and wattle work. The plan adopted for constructing the jetties was to drive piles 6 feet apart and 10 feet in depth on line of jetties, which piles were sawed off at a height of 6 feet above low water and then wattled with poles. On the sides and on the ends of the jetties brush mats loaded with riprap stone were placed, to prevent scour. The shore ends were protected by grading the bank to a slope about one and one-half to one, and staking and wiring 18 inches of compact brush covered with stone. This kind of bank protection, however, has proven of too slight a character, especially where the banks are composed mainly of sand and easily eroded. With the exception of the bank-protection work, the jetties have all stood the spring freshets well and have about doubled the depth of water in the channel through the bar. Work was completed October 26, 1892.

Snagging operations.—The snagboat *Toccoa*, after completing work in the Savannah River, arrived at Doctortown June 10. A rise in the river prevented her commencing work until June 20. While waiting for a suitable stage of water for snagging work, the boat proceeded to Tillmans Bar in the Ocmulgee River and aided the steam-hoister in making repairs to the jetties at that bar.

At Bug Suck, 94 miles from the Forks, a large cypress stump in the center of the channel was removed. This stump has damaged rafts and other crafts for a period of thirty years, and numerous unsuccessful attempts had been made in past years by the snagboats to remove it. The current being very strong and although there was a depth of 16 feet of water around the snag, it was thoroughly imbedded in the sand.

Beards Bluff Bar.—Twelve piles were driven and wattled with poles, closing the slough above the bar and completing the work at this bar. Since the construction of the jetties at this bar the water in the channel has been doubled at low stage. All the jetties are in good condition. The bank-protection work has been slightly damaged by the recent freshets.

There have been removed from the channel 21 snags and 3 stumps, and 1,305 overhanging trees and 16 projecting logs from the banks; 148 pounds of explosives have been used in the above work.

No new lines of steamboats have been established during the year.

Submitted with this report are the following statements:

(1) Statement of work done to date.

Commercial statistics, Altamaha River, Georgia, 1892-'93.

Articles.	Tons.	Value.	Articles.	Tons.	Val.
Timber	171,000	$684,000	Fertilizers	692	$[illegible]
Rosin	14,280	142,800	Corn	375	[illegible]
Turpentine	4,750	237,500	Cotton seed	220	[illegible]
Cotton	745	130,375	Passengers	263	[illegible]
Staves	250	15,000			
Merchandise	2,346	351,900	Total	194,921	1,6[illegible]

List of steamboats plying the Altamaha River, 1892-'93.

Name.	Draft, light.	Tonnage, registered.	Terminal points.
	Inches.		
Americus	24	229.35	Doctortown and Darien, Ga.
Altamaha	17	219.27	Doctortown.
Swan	18	360.00	Doboy and Brunswick, Ga.

MISCELLANEOUS.

The work is located in the collection district of Brunswick, Ga. Amount of duties collected in 1892, $6,408.15. Sapelo Light is the nearest light-house and forts Oglethorpe and Pulaski are the nearest forts.

Since the existing project for improving Altamaha River was adopted, the following appropriations have been made for this work:

By act of Congress of—

August 11, 1888 (unexpended balance)	$241
September 19, 1890	15,000
July 13, 1892	15,000
Total	30,241

The total expenditures under the present project to June 30, 1893, including all outstanding liabilities, were $26,406.64.

It is proposed to expend the funds on hand and any that may become available during the present fiscal year in the removal of obstructions and in the improvement of the shoal places in the river, according to the revised project of 1890.

The sum of $50,000 can be economically and advantageously expended during the coming year. No permanent improvement can be effected, as new obstructions, caused by logs and snags, form during every freshet stage. They should, however, diminish in number from year to year. From $3,000 to $5,000 will be required for the annual maintenance of the completed work. The work of removing obstructions has been under the local charge of Mr. R. S. Burnett, assistant engineer, whose report is appended hereto.

Money statement.

July 1, 1892, balance unexpended	$7,146.66
Amount appropriated by act approved July 13, 1892	15,000.00
	22,146.66
June 30, 1893, amount expended during fiscal year	17,917.87
July 1, 1893, balance unexpended	4,228.79
July 1, 1893, outstanding liabilities	392.02
July 1, 1893, balance available	3,836.77
Amount (estimated) required for completion of existing project	99,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	50,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for improving Altamaha River, Georgia, opened on November 19, 1892, by Capt. O. M. Carter, Corps of Engineers.

No.	Name and address of bidder.	Fascines (4,000 cubic yards).		Pile work (600 linear feet).		Fender piles (5 clusters).	
		Price.	Amount.	Price.	Amount.	Price.	Amount.
1	Colin McK. Grant, Charleston, S. C.	$1.45	$5,800.00	$3.20	$1,920.00	$50.00	$250.00
2	*The Atlantic Contracting Co., New York, N. Y. (John F. Gaynor, president)	1.50	6,000.00	3.35	1,950.00	50.00	250.00

No.	Name and address of bidder.	Sawn timber (5,000 feet BM).		Iron bolts (1,000 pounds).		Riprap stone (300 cubic yards).		Total.
		Price.	Am'nt.	Price.	Am'nt.	Price.	Am'nt.	
1	Colin McK. Grant, Charleston, S. C.	$40.00	$200.00	$0.09	$90.00	$3.20	$960.00	$9,220 00
2	*The Atlantic Contracting Co., New York, N. Y. (John F. Gaynor president)	40.00	200.00	0.09	90.00	2.00	600.00	9,090.00

*Bid recommended for acceptance, they being the lowest responsible bidders for the best and most suitable material and services.

Amount available $10,000.

REPORT OF MR. R. S. BURNETT, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Savannah, Ga., July 3, 1893.

CAPTAIN: I respectfully submit the following report on the improvement of the Altamaha River, Georgia, for the fiscal year ending June 30, 1893.

Marrowbone Bar.—Work was continued on this bar by the steam-hoister and pile-driver constructing deflecting jetties by hired labor and the purchase of material in open market. Twelve jetties were constructed and six sloughs closed with pile and wattle work. The plan adopted for constructing the jetties was to drive piles 6 feet apart and 10 feet in depth on line of jetties, which piles were sawed off at a height of 6 feet above low water and then wattled with poles. On the sides and on the ends of the jetties brush mats loaded with riprap stone were placed, to prevent scour. The shore ends were protected by grading the bank to a slope about one and one-half to one, and staking and wiring 18 inches of compact brush covered with stone. This kind of bank protection, however, has proven of too slight a character, especially where the banks are composed mainly of sand and easily eroded. With the exception of the bank-protection work, the jetties have all stood the spring freshets well and have about doubled the depth of water in the channel through the bar. Work was completed October 26, 1892.

Snagging operations.—The snagboat *Toccoa*, after completing work in the Savannah River, arrived at Doctortown June 10. A rise in the river prevented her commencing work until June 20. While waiting for a suitable stage of water for snagging work, the boat proceeded to Tillmans Bar in the Ocmulgee River and aided the steam-hoister in making repairs to the jetties at that bar.

At Bug Suck, 94 miles from the Forks, a large cypress stump in the center of the channel was removed. This stump has damaged rafts and other crafts for a period of thirty years, and numerous unsuccessful attempts had been made in past years by the snagboats to remove it. The current being very strong and although there was a depth of 16 feet of water around the snag, it was thoroughly imbedded in the sand.

Beards Bluff Bar.—Twelve piles were driven and wattled with poles, closing the slough above the bar and completing the work at this bar. Since the construction of the jetties at this bar the water in the channel has been doubled at low stage. All the jetties are in good condition. The bank-protection work has been slightly damaged by the recent freshets.

There have been removed from the channel 21 snags and 3 stumps, and 1,305 overhanging trees and 16 projecting logs from the banks; 148 pounds of explosives have been used in the above work.

No new lines of steamboats have been established during the year.

Submitted with this report are the following statements:

(1) Statement of work done to date.

(2) Summary of work done by months.
(3) Summary of work done by localities.
Respectfully submitted.

R. S. Burnett,
Assistant Engine

Capt. O. M. Carter,
Corps of Engineers, U. S. A.

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1. *Altamaha River, Georgia.—Detail statement of work done to date, 1883–'93.*

	Jetties constructed.		Sloughs closed.		Snags.			Stumps.	Overhangi trees.	
									Cut.	
	No.	Quantity.	No.	Quantity.	First class.	Second class.	Third class.		Over 8 inches.	Under 8 inches.
		Lin. ft.		*Lin. ft.*						
1883–'92 (Report Chief of Engineers, U. S. Army, 1892)	10	1,744.2	.....	....	214	1,068	517	24	1,273	1,449
1892–'93	12	1,015.0	6	237	4	10	7	3	478	823
Total	22	2,759.2	6	237	218	1,078	524	27	1,751	2,272

	Trees girdled.	Logs on bank cut.	Piles driven.	Piles cut off.	Piles removed.	Stone quarried and transported to site of jetties.	Wattle-work constructed.	Bank protection constructed.	Brush used constructing mats.	Explosives used.
						Cu. yds.	*Lin. ft.*	*Lin. feet.*	*Cu. yds.*	*Lbs.*
1883–'92 (Report Chief of Engineers, U. S. Army, 1892)	5	10	239	239	2	141	1,914	......	1,646	15
1892–'93	......	16	231	231	......	230	1,252	79	1,630	148
Total	5	26	470	470	2	371	3,166	79	3,276	163

2. *Altamaha River, Georgia.—Summary of work by months, 1892–'93.*

Months.	Jetties constructed.		Sloughs closed.		Snags.			Stumps.	Overhangi trees.	
									Cut.	
	No.	Quantity.	No.	Quantity.	First class.	Second class.	Third class.		Over 8 inches.	Under 8 inches.
		Lin. ft.		*Lin. ft.*						
September	3	147	2	102	......	......	......	......	......	......
October	9	868	4	135	......	4	3	1	......	......
June	......	....	......	....	4	6	4	2	478	823
Total	12	1,015	6	237	4	10	7	3	478	823

*. *Altamaha River, Georgia.—Summary of work by months, 1892-'93*—Continued.

Months.	Logs on bank cut.	Piles driven.	Piles cut off.	Stone quarried and transported to site of jetties.	Wattle-work constructed.	Bank protection constructed.	Brush used constructing mats.	Explosives used.
				Cu. yds.	*Lin. ft.*	*Lin. ft.*	*Cu. yds.*	*Lbs.*
July	....	74	....	91	....	....	....	30
August	....	53	43	9	183	....	1006	5
ptember	....	67	18	70	147	79	624	35
tober	2	37	170	60	922	....	....	38
une	14	....	....	....	....	....	....	40
Total	16	231	231	230	1,252	79	1,630	148

. *Altamaha River, Georgia.—Summary of work by localities, 1892-'93, United States snag boat Toccoa.*

stances below forks.	Snags.			Stumps.	Overhanging trees.			Logs on bank cut.	Explosives used.	Distance below forks.	Snags.			Stumps.	Overhanging trees.			Logs on bank cut.	Explosives used.
						Cut.										Cut.			
	First class.	Second class.	Third class.		Pulled back.	Over 8 inches.	Under 8 inches.				First class.	Second class.	Third class.		Pulled back.	Over 8 inches.	Under 8 inches.		
[illegible]									*Lbs.*	*Miles.*									*Lbs.*
[illegible]	....	2	....	....	....	......	2	....	....	65¼	2	2	....	1	....	......	......	1	....
[illegible]	1	....	4	....	2	216	269	....	....	65½	....	2	3	....	....	......	......	....	....
[illegible]	1	....	....	....	....	115	259	....	....	94	....	....	....	1	....	......	......	....	40
[illegible]	....	4	....	1	2	109	195	....	....	Total	4	10	7	3	4	478	823	16	40
[illegible]	....	....	....	....	....	38	98	15	....										

N 6.

IMPROVEMENT OF OCONEE RIVER, GEORGIA.

The Oconee River rises in the northeastern part of Georgia, flows in a southeasterly direction, and unites with the Ocmulgee to form the Altamaha. A detailed description of this river is given in my report of the preliminary examination and survey, printed as House Ex. Doc. No. 211, Fifty-first Congress, first session. For a special history of that work, see p. 1253, Annual Report of the Chief of Engineers for 1889.

ORIGINAL CONDITION.

For the greater part of the year the river is navigable for steamboats drawing from 3 to 4 feet, but during the low-water season there are various shoals with low-water depths of not more than 2 feet. The chief obstructions to navigation consist of sand bars, rock shoals, overhanging trees, snags, and sunken logs.

PLAN OF IMPROVEMENT.

The plan of improvement, as outlined in my report of February 5, 1890, provides for the establishment of a navigable steamboat channel

3 feet deep at ordinary summer low water from Milledgeville to the river's mouth.

This is to be accomplished by (1) removing rafts, rock shoals, and sand bars; (2) enlarging portions of the river, revetting caving banks and closing incipient cut-offs; (3) removing snags and logs from the channel and overhanging trees from the banks of the stream.

The cost of the improvement is estimated at $171,000, provided funds are regularly and adequately supplied.

SUMMARY OF OPERATIONS PRIOR TO JULY 1, 1892.

Between 1812 and 1842 about $45,000 were expended by the State of Georgia in the improvement of this river, and between 1874 and 1875 about $8,575 were expended by the Oconee Steamboat Company between Dublin and the Central Railroad Bridge, a distance of [illegible] miles. Operations under the project adopted in 1878 were begun in 1878, and have been carried on at irregular intervals ever since, as the available funds allowed. A specific appropriation of $1,500 for improving the section of the river between Skull Shoals and the Georgia Railroad Bridge was expended so as to give a least depth in that reach of 20 inches at extreme low water.

In all there have been removed from the river 5,860 snags, 3,[illegible] overhanging trees, 487 cubic yards of rock; 648 trees have been deadened and 192 logs cut up on bank. Seven trees have been girdled and 366.5 cords of drift material were cut up. Much work was done at Sweeneys Cut, which was filled up with logs, stumps, trees, two [illegible], two lattice bridges, and a bridge trestle. In cleaning out this cut [illegible] pounds of high explosives were used. Six hundred cubic yards of stone were quarried and placed in a closing dam at Fish Trap Cut.

The work at Old Boat Yard was completed. There were driven at this place 165 piles; 935 linear feet of piling were wattled and [illegible] linear feet of brush mattresses 18 feet wide were sunk and covered with stone. In addition 13 snags and stumps were removed, and the banks at the ends of the dam were protected with brush and stone.

The work of building a new snag boat, the *Satilla*, under contract with Messrs. M. A. Sweeney & Bro., was completed October 3, 18[illegible]

Up to July 1, 1893, the total expenditure for the work, including all outstanding liabilities, was $33,264.15.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1893.

The snag boat *Ocmulgee* commenced active operations January 28, 1893, and continued the same to the end of the fiscal year, with the exception of about one month's interruption on account of the high stage of the river. Work was started at the Central Railroad Bridge, near Oconee, Ga., 107¾ miles from the mouth, and thence continued upstream toward Milledgeville, the contemplated head of navigation. There were removed 1,588 snags and stumps, 81 overhanging trees, and 61 logs were cut up on the river banks.

CONDITION OF WORK JUNE 30, 1893.

The channel from the Central Railroad Bridge to 11½ miles above it has been cleared of obstructions and is in a good navigable condition.

The shore protection at Old Boat Yard has been slightly damaged by the late freshets; the spur dams at this place are in good condition.

COMMERCE AND NAVIGATION.

The Oconee River is navigable from the mouth to Milledgeville, a distance of 147 miles. The boats engaged in the river traffic during the year were the *Lumber City*, running from Little Oakey Bluff, 34 miles from the forks, to Ocmulgee Station, where the East Tennessee, Virginia and Georgia Railway crosses the Ocmulgee River 12 miles from the forks; the steamer *Louisa*, running from Dublin (79 miles) to Red Bluff (41 miles), and also making irregular trips up the river from Dublin; the steamers *R. C. Henry*, *Gypsie*, and *Mary Elizabeth* running above and below Dublin, Ga., and the steamer *Swan*, running irregularly from Little Oakey Bluff to Brunswick, Ga.

List of steamboats plying the Oconee River, 1892-'93.

Name.	Draft, light.	Tonnage, registered.	Terminal points.
	Inches.		
Lumber City	22	336.71	Ocmulgee depot.
Louisia	20	220.00	Dublin, Ga,
R. C. Henry	14	140.00	
Gypsie	20	70.00	
Mary Elizabeth	32	4.50	
Swan	18	360.00	Doboy, Ga.

These boats carry annually about 23,500 tons of freight, valued at $935,250. The freights consist of iron, spirits of turpentine, cotton, guano, and general merchandise. In addition to the freights carried by the steamers, it is estimated that there are annually drifted down the river 40,320,000 feet or 72,000 tons of timber, valued at $362,880.

The total annual commerce of this river is therefore 95,517 tons, valued at $1,298,130. Freight rates have been redued 50 per cent since the work of improving the river began in 1878.

With a continuation of the improvement now in progress to Milledgeville, new lines of boats will be established and through freights carried to the coast; the valuable hard wood timber of the swamps will be developed, and a large section of farming land will be made accessible throughout the year to a market reached by cheap river transportation.

In the counties bordering the Oconee River the population is about 90,000, the area of cultivated lands about 507,000 acres, and the value of all property from $10,000,000 to $11,000,000. The area tributary to the river is about 1,900 square miles.

In view of the information collected, it is estimated that the commerce on the river after improvement will amount to three times its present value.

Commercial statistics, Oconee River, Georgia, 1892-'93.

Articles.	Tons.	Value.	Articles.	Tons.	Value.
Cotton	1,100	$192,500	Corn	610	$26,840
Rosin	14,570	145,700	Cotton seed	490	9,800
Turpentine	2,155	102,060	Passengers	850	12,750
Timber	72,000	362,880			
Fertilizer	890	17,800	Total	95,517	1,298,130
Merchandise	2,852	427,800			

MISCELLANEOUS.

The work is located in the collection district of Brunswick, Ga. Amount of duties collected in 1892, $6,408.15. Sapelo Light is the nearest light-house, and forts Oglethorpe and Pulaski are the nearest forts.

Since the existing project for improving Oconee River was adopted, the following appropriations have been made for this work:

By act of Congress of—	
August 11, 1888 (unexpended balance)	$201.[illegible]
September 19, 1890	25,000.[illegible]
July 13, 1892	25,000.[illegible]
Total	50,201.[illegible]

The total expenditures under the present project to June 30, 1893, including all outstanding liabilities, were $33,264.15.

As outlined in my project of February 5, 1890, it is proposed to expend the available funds, and any funds that may become available during the year, in the removal of obstructions and in the improvement of the shoals in the river between Milledgeville and the mouth.

The sum of $50,000 can be economically and advantageously expended during the coming year. No permanent improvement can be effected, as new obstructions, caused by logs and snags, form during every high water season. They should, however, become fewer in number each year. From $1,000 to $5,000 will be required for the annual maintenance of the completed work. The work of removing obstructions has been in the local charge of Mr. R. S. Burnett, assistant engineer, whose report is appended hereto.

Money statement.

July 1, 1892, balance unexpended	$2,797.[illegible]
Amount appropriated by act approved July 13, 1892	25,000.[illegible]
	27,797.[illegible]
June 30, 1893, amount expended during fiscal year	10,635.[illegible]
July 1, 1893, balance unexpended	17,162.[illegible]
July 1, 1893, outstanding liabilities	225.[illegible]
July 1, 1893, balance available	16,937.[illegible]
Amount (estimated) required for completion of existing project	121,000.[illegible]
Amount that can be profitably expended in fiscal year ending June 30, 1895	50,000.[illegible]

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

REPORT OF MR. R. S. BURNETT, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Savannah, Ga., July 3, 1893.

CAPTAIN: I respectfully submit the following report on the improvement of the Oconee River, Georgia, for the fiscal year ending June 30, 1893.

During the past year operations have been confined to the removal of snags obstructing the channel between the Central Railroad Bridge and Milledgeville, Ga.

The snag boat *Ocmulgee* was thoroughly overhauled and, with the exception of some minor repairs, put in good condition at Savannah. The snag boat left Savannah December 28, with the hoister and two small barges in tow, and which were to be delivered at Tillmans Bar, Ocmulgee River. On her arrival at Tillmans Bar she proceeded to Ocmulgee Depot to obtain material for making some necessary minor repairs. After these repairs had been completed, on January 10 it was deemed advisable to have the boat run through to Milledgeville, Ga., for the purpose of making a thorough inspection of the river to determine the most desirable locality for commencing operations. In making this trip the boat was delayed four days at the Central Railroad Bridge on account of the failure in operating the draw; also by obstructions in the channel through the draw. These obstructions were removed sufficiently to enable the boat to pass through, and she arrived at Milledgeville January 26.

The river was found continuously obstructed by snags, and it was deemed most practical to commence work at the Central Railroad Bridge and work up river to Milledgeville. On January 28 work was started at the bridge, 107¾ miles from the mouth of the river. On March 2 work was suspended on account of high water, which continued until April 5, when work was resumed and continued until June 30.

All obstructions in the channel have been removed between 107¾ miles and 119½ miles from the mouth of the river. During the past year 1,521 snags and 67 stumps were removed from the channel, and 81 overhanging trees and 61 projecting logs from the bank.

During past years the river has been practically unnavigable, excepting at a high stage of water, on account of the accumulated obstructions.

Steps are now being taken to place new lines of boats on the river and also to get out the hard-wood timber in the swamps. Steamboats can not successfully run until the work of removing obstructions has been completed through to Milledgeville.

The following statements accompany this report:

(1) Summary of work done by localities.
(2) Summary of work done by months.
(3) Detailed statement of work done to date.

Respectfully submitted.

R. S. Burnett,
Assistant Engineer.

Capt O. M. Carter,
Corps of Engineers, U. S. A.

1. Oconee River, Georgia.—Summary of work by localities, 1892–'93.

Distance above forks.	Snags.			Stumps.	Overhanging trees.			Trees girdled.	Logs on bank cut.	Explosives used.
	First class.	Second class.	Third class.		Pulled back.	Cut. Over 8 inches.	Cut. Under 8 inches.			
Miles.										*Lbs.*
107¾	6	14	26	1	....	1	....	14	14	....
108½	8	24	31	...	....	....	....	....	....	....
108¾	15	37	21	1	....	....	....	....	....	....
109	5	37	13	1	....	....	2	....	....	....
109¼	3	21	10	...	....	....	....	....	....	....
109½	3	11	2	...	....	....	4	....	1	....
109¾	6	17	8	1	....	....	....	....	1	2¼
110	5	15	6	1	....	....	....	....	2	....
110¼	5	2	8	...	....	....	4	....	1	....
110½	3	10	2	...	1	....	8	....	....	5
110¾	3	19	....	...	....	....	....	....	....	....
111	4	19	11	1	....	....	....	....	....	....
111¼	2	19	10	1	....	....	....	....	....	5
111½	1	2	13	1	....	....	....	....	....	....
111¾	3	10	5	1	....	....	....	....	....	....
112	1	3	4	...	....	....	....	....	....	....
112½	1	16	1	1	....	....	....	....	....	....
112¾	4	11	3	1	....	....	....	....	....	....
113	2	5	1	...	....	....	....	....	....	....
113¼	4	7	6	...	....	....	....	....	....	....
113½	2	6	6	...	....	....	....	....	....	....
113¾	6	5	5	1	....	....	....	....	....	....
114	3	4	12	...	....	....	....	....	....	....
114¼	9	18	13	...	....	....	....	....	....	....
114½	4	13	3	2	....	....	....	....	....	....
114¾	7	17	4	...	....	....	2	....	3	....
115	4	14	10	...	....	....	2	....	....	....
115¼	11	37	25	5	....	....	6	....	....	10
115½	6	13	8	2	....	....	....	....	1	....
115¾	5	12	5	1	....	....	....	....	....	....
116	5	13	5	...	....	....	....	....	....	5
116¼	5	20	9	1	....	....	....	....	5	....
116½	9	27	9	...	....	....	4	....	4	....
116¾	7	41	15	2	....	....	....	....	2	2
117	2	8	3	1	....	5	....	....	2	....
117¼	5	20	4	1	10	....	....	....	....	....
117½	4	14	5	3	....	....	10	....	3	....
117¾	11	27	7	...	....	....	....	....	3	....
118	7	30	9	3	....	1	....	....	2	....
118¼	5	25	7	1	....	....	....	....	....	....
118½	6	41	19	6	....	6	....	....	1	....
118¾	7	41	15	7	....	9	....	....	3	14
119	19	112	23	17	....	4	....	....	5	1
119½	3	20	6	3	....	2	....	....	8	2
Total.	236	877	408	67	11	28	42	14	61	45½

2. Oconee River, Georgia—Summary of work by months, 1892-'93.

Months.	Total days worked.	Number of days removing obstructions.	Snags.*. First class.	Snags.*. Second class.	Snags.*. Third class.	Stumps.	Overhanging trees. Cut. Over 8 inches.	Overhanging trees. Cut. Under 8 inches.	Overhanging trees. Pulled back.	Trees girdled.	Logs on bank cut.
January	26	5	6	14	26	1	1	......	......	14	14
February	28	22½	26	102	65	1	......	10	......	......	......
March	3	2	2	16	2	......	......	......	......	......	......
April	30	22	35	125	60	7	......	8	1	......	5
May	31	26	91	251	142	14	......	14	......	......	13
June	30	25	76	369	113	44	27	10	10	......	29
Total	148	102½	236	877	408	67	28	42	11	14	61

* First-class snags are more than 2 feet in diameter at butt. Second-class snags are more th inches in diameter at butt. Third-class snags are under 8 inches in diameter at butt. All logs trees under water are considered snags

3. Oconee River, Georgia.—Detail statement of work done to date, 1893.

	Snags. First class.	Snags. Second class.	Snags. Third class.	Stumps.	Overhanging trees. Pulled back.	Overhanging trees. Cut. Over 8 inches.	Overhanging trees. Cut. Under 8 inches.	Trees girdled.	Logs on bank cut.	Explosives used.	Driftwood cut.	Rock removed.	Rock quarried and placed in dams.
										Lbs.	*Cords*	*cu.yds*	*cu.yds*
1878-'92 (Report of Chief of Engineers, U. S. Army, 1892)	1,089	3,166	1,194	263	2,253	12,411	19,965	656	475	612	366½	490	600
1892-'93	236	877	408	67	11	28	42	14	61	45¼	......	......	......
Total	1,325	4,043	1,602	330	2,264	12,439	20,007	670	536	657¼	366½	490	600

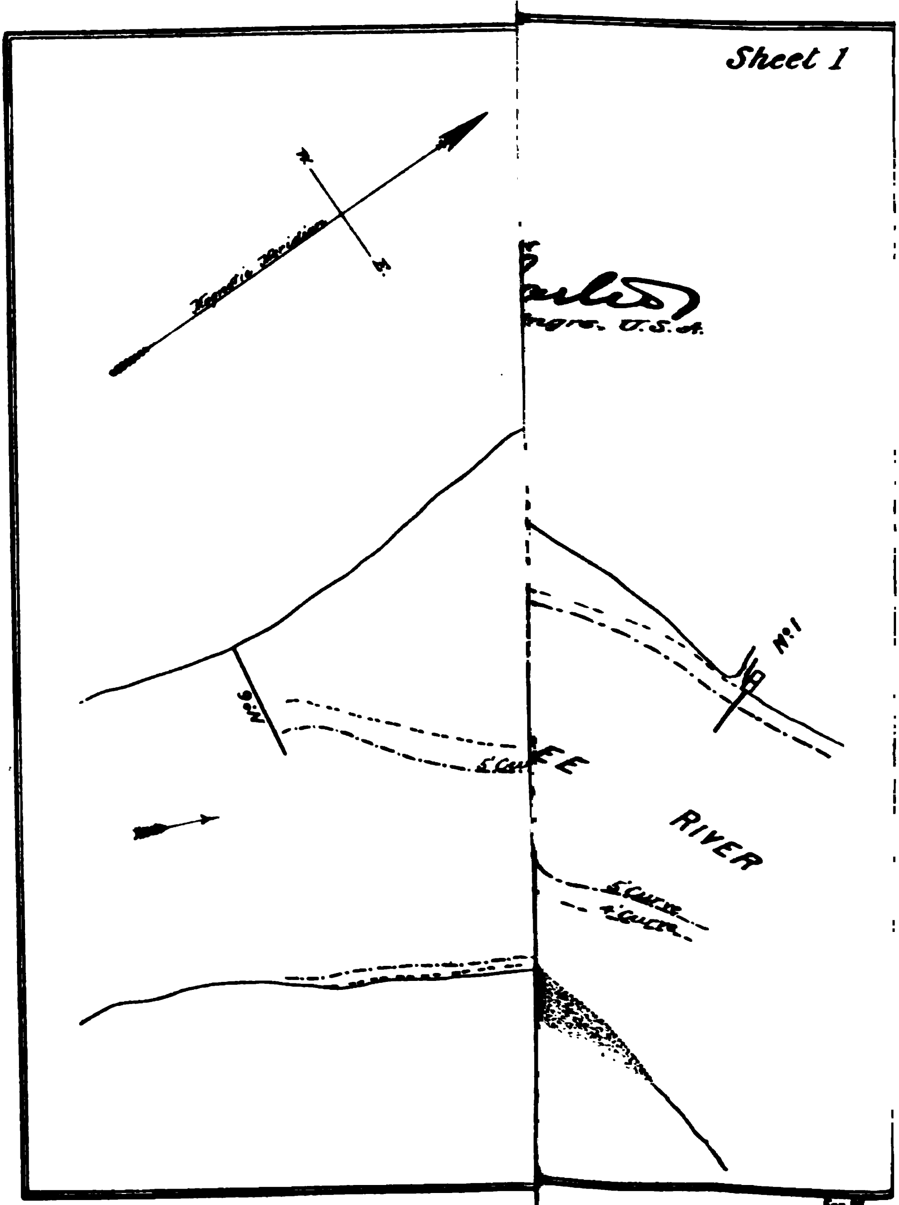
N 7.

IMPROVEMENT OF OCMULGEE RIVER, GEORGIA.

The Ocmulgee River is formed by the junction of the South and Ye low rivers, about 20 miles below Covington, and flows thence in southeasterly direction about 250 miles, where it unites with Oconee form the Altamaha. A detailed description of this river is found in report of the preliminary examination and survey, printed as Hou Ex. Doc. No. 215, Fifty-first Congress, first session. For a special hi tory of past work, see p. 1258, Annual Report of the Chief of En neers for 1889.

ORIGINAL CONDITION.

For the greater part of the year the river is navigable for steambo drawing from 3 to 4 feet, but during the low-water season there various shoals with depths of not more than 2 feet. The chief obstr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tions to navigation consist of rock shoals, sand bars, overhanging trees, snags, and sunken logs.

PLAN OF IMPROVEMENT.

The plan of improvement, as outlined in my report of February 5, 1890, provides for the establishment of a navigable steamboat channel 3 feet deep at ordinary summer low water, from Macon to the river's mouth.

This is to be obtained by: (1) Removing rock shoals and sand bars; (2) closing incipient cut-offs and revetting caving banks; (3) removing snags and logs from the channel and overhanging trees from the banks of the stream.

The cost of the improvement is estimated at $210,000, provided funds are regularly and adequately supplied.

SUMMARY OF OPERATIONS PRIOR TO JULY 1, 1892.

Between 1817 and 1837 the State of Georgia expended about $60,000 in the improvement of the river, $10,000 of which were used above Macon. In August, 1887, operations were begun under the project approved by Congress in 1876, and the work has been carried on at intervals, as the funds were available. In all there have been removed from the river 10,803 snags and stumps, 29,628 overhanging trees, 359 cubic yards of rock, and 1,869 cubic yards of earth; 212 logs were cut up on the banks; 869 trees were deadened; 11 jetties were built at Tillmans Bar, 2 snag dams at Ashley Landing, and 1 at Indian Timber Landing. Up to July 1, 1892, the total expenditures for the work, including all outstanding liabilities, amounted to $177,446.82.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1893.

The snagboat *Satilla* commenced operations on the river October 24, 1892, and continued the same to the end of the fiscal year. There were removed 2,187 snags and stumps and 831 overhanging trees; 34 logs were cut up on the river bank, and 52 trees were girdled. In all, there were improved 191½ miles of river.

The steam-hoister, rigged as a pile-driver, began work on the river January 5, 1893, and continued work until the end of the fiscal year. All the old spur-dams at Tillmans Bar, 11 in number, had been thoroughly repaired and one new one, 280 feet long, has been constructed. In this work there were driven 124 piles, and there were used 1,163 cubic yards of brush mattresses, 832 cubic yards of riprap stone, and 2,085 20′ x 3″ poles for wattling.

There were built 278 linear feet of crib bank protection, for which 1,080 cubic yards of material had to be excavated and in the construction of which there were used 94,332 feet, B. M., of 12 x 12 inch timber, 280 cubic yards of stone, and 2,500 pounds of iron spikes; 972 cubic yards of stone were quarried and transported to the site, and 309½ pounds of explosive were used.

CONDITION OF WORK JUNE 30, 1893.

The channel has been cleared of obstructions from the mouth to Macon and is now in a good navigable condition.

The spur dams at Tillmans Bar are in good condition and there is now a least channel depth of 4.7 feet across the bar.

COMMERCE AND NAVIGATION.

The following is a list of steamers plying the Ocmulgee River dur the fiscal year of 1892-'93:

List of steamboats plying the Ocmulgee River, 1892-'93.

Name.	Draft, light.	Tonnage, registered.	Terminal points.
	Inches.		
Harry G. Day	16	290	Ocmulgee Depot.
Lumber City	16	330	
Swan	18	360	Brunswick, Ga.
Mascotte	16	250	Macon, Ga.
J. C. Stewart	18	235	Abbeville, Ga.

These boats carry annually about 23,500 tons of freight, valued $935,250. The freight consists mainly of rosin, spirits of turpent guano, and general merchandise. In addition to this it is estima that there are annually rafted over the river 50,960,000 feet, or 91, tons of timber, valued at $362,880. The total annual commerce of river is therefore 110,293 tons, valued at $1,356,915.

A full and carefully prepared statement of the conditions and cumstances that will affect this commerce, when the river is place a thoroughly navigable condition from its mouth to the city of Mac is contained in Mr. J. L. Van Ornum's report on the survey of Ocmulgee River, accompanying my report of February 5, 1890, a printed as part of Appendix O 12, Report of Chief of Engineers 1890, to which I respectfully refer. It is impossible to make an accur estimate of the increased commerce that will follow such improveme But remembering that new boats are to be added to the Lumber C Hawkinsville and Abbeville lines; that citizens of Macon await opening of the freighting season to fully establish a line of steam to the coast; that more frequent trips can be made and larger carg carried; and that a new region between Hawkinsville and Macon w become tributary to the river, it is not an extravagant estimate to s that the commerce of the river may be increased 100 per cent of present value.

Commercial statistics, Ocmulgee River, Georgia, 1892-'93.

Articles.	Tons.	Value.	Articles.	Tons.	Val
Timber	91,000	$458,640	Fertilizers	767	[illegible]
Resin	9,216	92,160	Corn	260	[illegible]
Turpentine	2,975	148,750	Cotton Seed	180	[illegible]
Cotton	270	47,250	Passengers	1,225	[illegible]
Staves	1,550	124,000			
Merchandise	2,850	427,500	Total	110,293	1,3

MISCELLANEOUS.

The work is located in the collection district of Brunswick, Ga. Amount of du collected in 1892, $6,408.15. Sapelo Light is the nearest light-house, and forts Og thorpe and Pulaski are the nearest forts.

Since the existing project for improving Ocmulgee River was adopted the following appropriations have been made for this work:

By act of Congress of—	
August 11, 1888 (unexpended balance)	$244.95
September 19, 1890	30,000.00
July 13, 1892	25,000.00
Total	55,244.95

The total expenditures under the existing project to June 30, 1893, including all outstanding liabilities, amounted to $43,782.35.

As outlined in my project of February 5, 1890, it is proposed to expend any funds now available or that may become available during the present fiscal year in the removal of obstructions and in the improvement of the shoals in the river between Macon and the river's mouth.

The sum of $50,000 can be economically and advantageously expended during the coming year. No permanent improvement can be effected, as new obstructions, caused by logs and snags, form during every high-water season. They should, however, become fewer in number each year. From $1,000 to $5,000 will be required for the annual maintenance of the completed work. The work of removing obstructions has been under the local charge of Mr. R. S. Burnett, assistant engineer, whose report is appended hereto.

Money statement.

July 1, 1892, balance unexpended	$2,039.18
Amount appropriated by act approved July 13, 1892	25,000.00
	27,039.18
July 30, 1893, amount expended during fiscal year	15,080.55
July 1, 1893, balance unexpended	11,958.63
July 1, 1893, outstanding liabilities	496.03
July 1, 1893, balance available	11,462.60
Amount (estimated) required for completion of existing project	155,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	50,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

REPORT OF MR. R. S. BURNETT, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Savannah, Ga., July 3, 1893.

CAPTAIN: I respectfully submit the following report on the improvement of the Ocmulgee River, Georgia, for the fiscal year ending June 30, 1893.

The work done on this river during the past fiscal year has consisted of the removal of snags from the channel between its mouth and Macon, Ga., and the construction of one jetty and the repairing of 11 jetties at Tillmans Bar, 5¼ miles from its mouth.

Snagging operations.—The snag boat *Satilla* was outfitted at Savannah and left for the Ocmulgee River October 13, and arrived at Ocmulgee Depot October 19. The boat was delayed at Ocmulgee Depot until the 24th, making minor repairs and fitting up tools for work. Operations were commenced 12¼ miles from the mouth of the river and continued to Macon, Ga., 203 miles.

During the year there were removed from the channel 2,125 snags and 62 stumps, and 831 overhanging trees and 34 logs from the banks, 52 trees were girdled; length of river improved, 191¼ miles. That portion of the river between Holliman's Ferry (165¼) and Macon (203) had not been worked before and years' accumulations of snags made the progress of the snag boat necessarily slow. A good low-water channel averaging 150 feet in width has been cleared of snags from Macon to the mo As a result of this improvement, the Macon and Brunswick Steamboat Comp has been organized at Macon and is now running a boat from Macon to local po below; and when the freighting season arrives the company proposes to place a l of boats from Macon to Brunswick and Darien, Ga. A new line is also to be pl between Hawkinsville and Abbeville, Ga.

The railroad companies are offering to close contracts with the merchants of Ma on through freights at $1 per 1,000 pounds less than last year's rates.

All bridges crossing this river have been provided with draws, but are not ligh as required by the Light-House department.

Tillman's Bar.—The old jetties had been damaged by freshets to such an ext that they practically required reconstruction. Brush mattresses were sunk al their upper sides at their ends and for half their lengths on their lower sides, to p vent scour. New and substantial crib bank protection work, well ballasted w riprap stone, has been put in at the shore ends of the jetties; and a cluster of fen piles driven at their outer ends. One new jetty was built entire. The chan through the bar has not less than 4.5 feet at low-water. The steam hoister has b engaged on this work. One new jetty was constructed and 11 old jetties were paired; 972 cubic yards of stone were quarried and transported to the site of the ties; 7,861 linear feet of timber, 12 by 12 inches, were framed and used construct crib bank protection; 926 linear feet of jetty were wattled; 2,085 hard-wood poles w used in wattling work; 1,163 cubic yards of brush were cut and made into m tresses; 775 hard-wood poles were used constructing brush mats; 1,112 cubic ya of stone were placed on mattresses and in bank protection cribs; 124 piles w driven constructing and repairing jetties; 121 piles were cut off 6 feet above m low-water; 278 linear feet of crib bank protection were constructed; 1,080 cu yards of material were removed in excavating for constructing crib bank protect 2,500 pounds of ½ by 16 inch spikes were used in the construction of crib work, a 309½ pounds of explosives were used in the removal of snags and quarrying of rip stone.

Submitted with this report are the following statements:

(1) Statement of work done to date.
(2) Summary of work done by months.
(3) Summary of work done by localities.

Respectfully submitted.

R. S. BURNETT,
Assistant Engineer.

Capt. O. M. CARTER,
Corps of Engineers, U. S. A.

1. Ocmulgee River, Georgia.—Detail statement of work done to date, 1877–'93.

	Jetties repaired and constructed.		Snags.				Overhanging trees.					
								Cut.				
	Quantity.	Number.	First class.	Second class.	Third class.	Stumps.	Pulled back.	Over 8 inches.	Under 8 inches.	Trees girdled.	Logs on bank cut.	Piles driven.
1877–'92. (Report Chief of Engineers, U. S. Army, 1892)	993	11	1,332	6,951	2,260	280	3,155	11,704	13,507	874	212	......
1892–'93	1,273	*12	381	842	902	62	......	802	29	52	34	124
Total	2,266	23	1,713	7,793	3,162	342	3,155	12,506	13,536	926	246	124

1. *Ocmulgee River, Georgia.—Detail statement of work done to date, etc.*—Continued.

	Spikes used in constructing crib bank protection.	Stone placed on mats and in bank protection.	Stone removed from shoals.	Stone quarried and transported to site of jetties.	Wattle work.	Poles 20x3 inch cut and used in wattle work.	Brush cut and used in mats.	Poles cut and used constructing mats.	Timber 12x12 inches used in constructing bank protection cribs.	Material handled constructing bank protection and excavating.	Crib bank protection constructed.	Explosives used.
	Lbs.	*Cubic yards*	*Cubic yards*	*Cubic yards*	*Lin. feet.*		*Cubic yards*		*Lin. feet.*	*Cubic yards*	*Lin. feet.*	*Lbs.*
77–'92. (Report Chief of Engineers, U. S. Army, 1892.)	......	......	359	......	......	......	......	......		......	40	......
92–'93	2,500	1,112	......	972	926	2,085	1,163	775	7,861	1,080	278	309½
Total	2,500	1,112	359	972	926	2,085	1,163	775	7,861	1,080	318	309½

* Eleven jetties repaired, 1 constructed new throughout.

2. *Ocmulgee River, Georgia.—Summary of work by months, 1892–'93.*

Months.	Jetties worked.	Jetties constructed and repaired.	Snags.			Stumps.	Overhanging trees cut.		Trees girdled.	Logs on bank cut.	Piles driven.	Piles cut off.
			First class.	Second class.	Third class.		Over 8 inches.	Under 8 inches.				
		Lin. feet.										
October	......	......	15	84	8	1	27	1	......	......	......	......
November	......	......	26	75	53	6	26	5	......	1	......	......
December	......	......	45	118	35	27	42	......	......	3	......	......
January	......	......	49	81	40	6	52	......	......	2	34	......
February	......	......	28	90	89	2	419	......	......	13	......	55
March	......	......	......	......	......	......	......	......	......	......	......	......
April	......	295	47	101	245	7	124	......	23	5	14	......
May	5	450	97	227	222	9	80	......	29	8	76	66
June	7	528	74	116	210	4	32	23	......	2	......	......
Total	12	1,273	381	842	902	62	802	29	52	34	124	121

Months.	Stone quarried and transported to site of jetties.	Wattle work constructed.	Crib bank protection constructed.	Timber (12 by 12 inches) laid in crib work.	Stone placed on mats.	Stone placed in crib work.	Brush cut and used in mats and around ends of cribs.	Poles cut and used in wattle work.	Poles cut and used constructing mats.	Material excavated constructing bank protection cribs.	Explosives used.	Spikes used (⅜ by 16 inches) in constructing crib bank protection.
	Cubic yds.	*Lin. feet.*	*Lin. feet.*	*Lin. feet.*	*Cubic yds.*	*Cubic yds.*	*Cubic yds.*				*Lbs.*	
October	......	......	......	......	......	......	......	......	......	......	......	......
November	......	......	......	......	......	......	......	......	......	......	......	......
December	......	......	......	......	......	......	......	......	......	......	......	......
January	......	......	......	......	......	......	......	......	......	......	......	......
February	261	......	......	......	......	......	......	85	......	......	115½	......
March	267	......	......	......	......	......	......	......	......	61	52	......
April	339	525	......	680	181	......	231	540	500	375	91½	......
May	105	......	140	1,742	75	140	414	460	40	463	31	1,500
June	......	401	138	5,439	......	716	518	1,000	235	181	19½	1,000
Total	972	926	278	7,861	256	856	1,163	2,085	775	1,080	309½	2,500

3. Ocmulgee River, Georgia.—Summary of work by localities, 1892–'93.

Distance above forks.	Snags. First class.	Snags. Second class.	Snags. Third class.	Stumps.	Overhanging trees cut. Over 8 inches.	Overhanging trees cut. Under 8 inches.	Trees girdled.	Logs on bank cut.	Explosives.
Miles.									*Lbs.*
12¼	1	8	2	....	1	....	....	....	....
14¼	1	7	1	1	2	....	....	....	....
14¾	3	6	2	....	....	....	....	....	....
17	3	2	3	....	2	....	....	....	....
18¼	3	2	....	....	4	1	....	....	....
25¾	2	4	....	....	3	....	....	....	....
34¼	2	5	....	....	15	....	....	....	....
35½	1	4	5	....	5	....	....	....	....
47½	2	2	....	....	3	....	....	....	....
51½	....	3	4	....	....	....	10	....	....
57¼	1	18	7	....	1	....	....	....	....
59¾	3	6	2	2	2	....	....	....	....
61¼	3	10	5	4	6	5	....	....	....
69½	2	4	22	1	1	....	....	....	....
107	1	3	10	....	4	....	....	....	....
165¼	3	2	11	....	....	....	8	....	....
165¾	6	13	9	1	....	....	....	....	....
166	4	12	18	....	4	....	....	....	....
167	6	33	25	1	1	....	....	....	....
167¾	7	17	23	5	5	....	....	....	....
168¼	7	14	12	7	7	....	....	....	....
169¾	18	44	11	14	13	....	....	2	....
170	9	10	14	....	16	....	....	1	....
171½	7	17	27	3	5	....	....	....	....
172½	13	24	16	....	10	....	....	....	....
173	18	32	12	....	20	....	....	....	....
173¼	9	11	13	1	....	....	....	....	....
173½	7	38	20	2	5	....	....	....	....
173¾	4	19	21	....	26	....	....	....	....
174¼	10	20	30	....	3	....	....	....	....
174½	12	49	32	3	120	....	....		
175	21	34	45	2	24	....	....		
175¼	9	9	18	....	1	....	....		
175½	20	29	48	2	3	....	....		
176	10	30	29	....	7	....	....		
176¾	20	34	33	....	8	16	....		
177	6	17	31	....	4	7	....		
177¼	8	20	24	1	....	....	....		
177½	2	10	2	....	87	....	5		
179½	12	14	26	....	10	....	....		
180½	5	18	8	....	158	....	3		
180¾	11	12	12	....	....	....	....		
181¼	8	10	22	1	13	....	5		
182	13	15	18	2	....	....	....		
182¼	7	15	5	....	20	....	....		
183¼	10	13	15	....	....	....	6		
183½	12	20	25	3	....	....	....		
185	4	15	20	....	150	....	....		
186	12	15	45	....	....	....	5		
188	3	22	20	2	50	....	....		
188¼	11	8	22	....	62	....	....		
190½	3	20	32	1	18	....	....		
193¼	1	11	8	....	1	....	....		
198	2	6	17	2	....	....	....		
198¾	1	2	6	1	1	....	....		
199¾	1	1	8	....	1	....	....		
200	1	3	6	....	....	....	....		
Total.	381	842	902	62	902	29	42		

N 8.

IMPROVEMENT OF BRUNSWICK HARBOR, GEORGIA.

About 2 miles above the city of Brunswick, Turtle River is divided by Buzzard Island into two branches, the smaller one, flowing to the eastward of the island and upon which the city of Brunswick is situated, being known as East River, the other retaining the name of Turtle River. These streams unite again about 1½ miles below the city to form Brunswick River. The lower part of East River forms what is known as the harbor of Brunswick. Operations for the improvement of this harbor have been carried on in accordance with a project of improvement prepared by Gen. Gillmore, the officer then in charge, and printed as Appendix M 12, Annual Report of the Chief of Engineers for 1886. The project is an enlargement and a modification of a previous one submitted by the same officer and printed as Appendix J, Annual Report of the Chief of Engineers for 1880.

For a special report of past work see page 1047, Annual Report of the Chief of Engineers for 1888, and the annual reports of the same officer since that date.

ORIGINAL CONDITION.

Turtle and Brunswick rivers have low-water depths of from 4 to 6 fathoms. Over the shoal in the East River, in front of the city, there has, when the existing project of improvement was adopted, a low-water depth of only 1½ fathoms. The mean rise and fall of tide is about 8 feet.

PLAN OF IMPROVEMENT.

The following comprise the main features of the plan of improvement:

(1) A training wall, projecting from the most easterly point of Buzzard Island and located approximately parallel to, and 1,000 feet or less distant from, the opposite shore of East River.

(2) A low dam across Turtle River, extending obliquely upstream from the upper end of Buzzard Island to the opposite shore of Blythe Island.

(3) Short spur jetties in the lower part of East River.

(4) Dredging in the vicinity of Turtle River dam and on the shoal in the lower part of East River.

The training wall and spurs were to be constructed of palmetto cribs loaded with stone, or of successive courses of log and brush mattresses loaded with riprap stone. The works were intended to establish and maintain a 15-foot low-water channel across the shoal in East River. The cost of the original project was estimated at $73,187.50, and, as modified, at $190,000.

In 1836 an appropriation of $10,000 was made for the removal of the shoal in East River. Since the adoption of the existing project nine appropriations have been made by Congress for the work, aggregating $190,000.

The project of improvement needs revision.

SUMMARY OF OPERATIONS PRIOR TO JULY 1, 1892.

A training wall was constructed, springing from a point on the east side of Buzzard Island and extending N. 77° 30′ E. 335 feet; thence S. 14° 30′ 650 feet; thence S. 12° E. 3,549 feet to its present end.

The return work (with the exception of a shore extension 35 feet in length, built of log mattresses) and 780 feet of the main training wall were constructed of palmetto cribs; the rest of the training walls, 3,419 feet in length, of double raft mattresses loaded with riprap stone. Forty-nine cribs were used, 14 of which are in the return work. Each crib is from 20 to 25 feet in length and from 9 to 13 feet in width. The cribs were filled with brush and dredge material capped with stone, and rose from the bottom to the level of mean low water.

The double raft mattresses are from 30 to 40 feet wide, from 3 to 4 feet thick, and are loaded with about 12 inches of stone. In raising to a higher level the work already done ordinary log and brush mattresses from 15 to 30 feet in width and loaded with from 4 to 8 inches of stone were used.

The old palmetto crib work being too narrow to build upon foundation courses of mattresses 30 feet wide were laid behind these cribs and close against them. Upon this foundation, courses of mattresses 20 feet in width were laid until the work was raised to the level of the old cribs. The next course then overlapped the old crib work, and upon this new crest mattresses of from 15 to 20 feet in width were laid. Along the return face and at the angle point apron mattresses were laid on the channel side of the work to guard against scour. The return face was brought up to mean high water and the training wall to

4 feet above mean low water at the angle, gradually sloping down to the level of low water at a point 780 feet beyond.

In 1889 work was resumed, and up to July 1, 1891, the crest had been brought up with brush fascines loaded with riprap stone to about 5 feet above mean low water for a distance of 2,290 feet, measured from the return angle of the work. There were used in this work 14,000 cubic yards of fascines and 2,726.71 cubic yards of stone.

Dredged cuts from 60 to 100 feet in width and from 14 to 15 feet deep at mean low water were made at various times across the shoal. The material removed consisted of a mixture of sand, loam, and clay, and aggregated 249,719.24 cubic yards of material.

Up to July 1, 1892, the total expenditures for the work, including all outstanding liabilities, amounted to $161,694.86.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1893.

Under a contract for dredging awarded March 1, 1893, to P. Sanford Ross, work was begun on February 23 and continued until April 12. A cut about 4,830 feet in length and 60 feet in width was dredged through the shoal in East River to depths varying from 16 to 17½ feet at mean low water. In executing this work there were removed 29,933.1 cubic yards of material.

Jetty work under a contract awarded March 20, 1893, to the Atlantic Contract Company, was commenced June 22 and continued to the end of the fiscal year. Those places on the training wall where settlement had taken place were carried up to the full height of 5½ feet above mean low water. The southern portion of the training wall was carried up to the full height of 6 six feet above mean low water for a length of 700 feet, and to a height of about 3 feet above mean low water for a length of 50 feet. There were used in this work during the year 3,868.15 cubic yards of fascines and 412.06 cubic yards of riprap stone.

The current operations required for a revision of the project were commenced during the year but could not be completed. They will be made during the coming fiscal year and their results submitted in a supplementary report.

CONDITION OF WORK JUNE 30, 1893.

The training wall is in good condition.

Considerable dredging done during the year has resulted in making the 15-foot curve continuous over the shoal in the East River, the least practicable channel depth being about 16 feet at mean low water.

COMMERCE AND NAVIGATION.

Previous to the year 1871 the city of Brunswick was of slight commercial importance, the value of the exports for that year being less than $500,000. In 1875 the value of the total exports had increased to $639,000. From that year up to the present, and especially since 1880, the importance of the city of Brunswick has increased with remarkable rapidity.

In 1880 the population of Brunswick was 2,981; it is now estimated at more than 12,000, and is still growing at the same rate. Taxable property increased in value from $1,300,000 in 1880 to $6,000,000 in 1890. The naval-stores business did not begin here until 1875, but now there is a yearly business of more than $1,000,000. During the same period the lumber business shows an enormous increase. The supply f yellow-pine timber is within easy reach of this port and is practially inexhaustible. White oak, ash, cypress, hard woods, American mahogany, and live oak are accessible within short distances, and all other classes of hard woods are obtainable in unlimited quantities from Alabama, Tennessee, and North Georgia. In 1880 there were shipped from this port 37,000,000 feet of lumber; in 1892 the shipments of lumber amounted to 138,035,000 feet, valued at $1,657,220. Lumber was at one time the chief export of Brunswick, but cotton now holds that place. The exports of this staple during the season of 1884–'85 amounted to but 4,000 bales. Since then the exports of this article have increased wonderfully, and the present annual shipments amount to about 170,000 bales, valued at $6,472,000.

The following lines of steamers have been established:

Mallory Line, Brunswick to New York, one steamship per week.
Brunswick to Savannah, two steamers per week.
Brunswick to Fernandina, one steamer per day.
Brunswick to Darien, one steamer per day.
Brunswick to river points, seven steamers per week.

The passenger traffic to and from New York over the line now in operation would be greatly stimulated were the outer bar improved so that the steamship company could positively announce the departure of its steamers from Brunswick at the same hour every sailing day, irrespective of tides. The inward-bound steamers are often compelled to wait outside the bar for high water, and this circumstance tends to retard the development of the inward passenger traffic.

Besides the lines of steamers previously mentioned a large fleet of foreign and coastwise steam and sailing vessels is engaged in the Brunswick trade, which consists principally of shipments of cotton, naval stores, and lumber.

Shipments, foreign and coastwise.

Articles.	1891.			1892.		
	Amount.	Value.	Tons.	Amount.	Value.	Tons.
Cotton.....................bales..	183,382	$7,354,971	44,410	170,643	$6,472,375	42,660
Rosin....................barrels..	153,146	306,292	21,440	206,179	556,683	25,772
Turpentine..................do....	42,440	509.280	9,780	48,944	709,688	11,382
Lumber....................M feet..	125,074	1,250,740	300,177	138,035	1,657,220	345,088
Cross-ties................number..	625,372	250,148	62,537	961,800	480,900	50,621
Miscellaneous..............tons..	2,845	71,122	2,845	61,092	610,920	61,092
Total..........................	....	9,742,553	441,189	....	10,487,786	536,615
Estimated receipts by water, foreign and coastwise............	....	3,014,207	135,000	....	3,164,917	140,000
Total commerce.............	....	12,756,760	576,189	....	13,652,703	676,615

Persons interested in the trade of Brunswick estimate that owing to past work of improvement in the harbor freight rates have been reduced from 18 to 20 per cent, and that if the improvements were completed according to the existing project the total volume of trade would be increased 200 per cent.

MISCELLANEOUS.

The work is located in the collection district of Brunswick, Ga. The amount of duties collected in 1892, $6,408.15. St. Simons Light is the nearest light-house and Fort Clinch, Fla., the nearest fort.

Since the work of improvement has begun, the following app
tions have been made:

By act of Congress of—
March 3, 1879
June 14, 1880
March 3, 1881
August 2, 1882
July 5, 1884
August 5, 1886
August 11, 1888
September 19, 1890
July 13, 1892

Total

It was impossible to complete during the fiscal year the cu
measurements necessary for the proper revision of the project
provement. This work will be done at the earliest opportunity
revised project of improvement submitted. The sum of $15,000 c
economically and advantageously expended during the coming
year in maintaining the present channel depths by dredging.

The total expenditures to June 30, 1893, including all outsta
liabilities, amounted to $180,918.92.

Money statement.

July 1, 1892, balance unexpended		$
Amount appropriated by act approved July 13, 1892		27.
		28,
June 30, 1893, amount expended during fiscal year		11,
July 1, 1893, balance unexpended		17,
July 1, 1893, outstanding liabilities	$8,170.05	
July 1, 1893, amount covered by uncompleted contracts	8,769.69	
		16,
July 1, 1893, balance available		
Amount that can be profitably expended in fiscal year ending June 30, 1895		15,

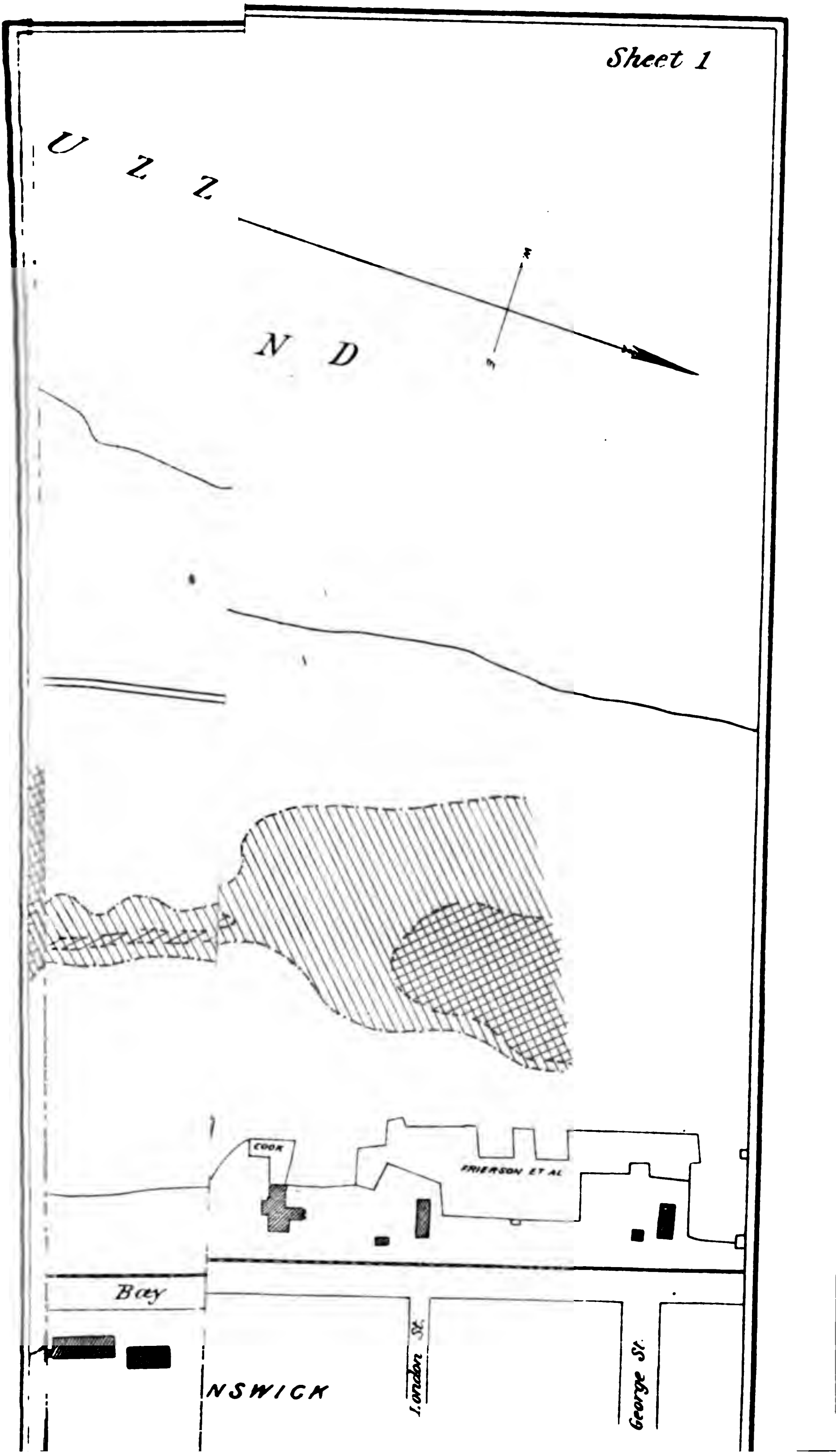
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for dredging at Brunswick Harbor, Georgia, opened on Feb 18, 1893, by Capt. O. M. Carter, Corps of Engineers.

No.	Name and address of bidder.	Price per cubic yard.	To
		Cents.	
1	H. M. C. Smith, Savannah, Ga.	27	
2	P. Sanford Ross, Jersey City, N. J*	25	

* Bid recommended for acceptance, he being the lowest responsible bidder for the best an suitable materials and services.

Amount available $6,000.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bstract of proposals for stone, mattress, and fascine work in Brunswick Harbor, Georgia, opened on March 4, 1893, by Capt. O. M. Carter, Corps of Engineers.

	Name and address of bidder.	Fascines.		Riprap stone.		Total.
		Price per cubic yard.	Amount.	Price per cubic yard.	Amount.	
1	Charles C. Ely, Savannah, Ga	$1.87	$13,090.00	$4.00	$8,000.00	$21,090.00
2	The Atlantic Contracting Co., New York, N. Y*	1.67	11,690.00	3.69	7,380.00	19,070.00

* Bid recommended for acceptance, they being the lowest responsible bidders for the best and most itable materials and services.

Amount available, $18,000.

COMMERCIAL STATISTICS.

rrivals and clearances of vessels and commerce at Brunswick, Ga., from January 1, 1878, to December 31, 1892.

ARRIVED.

Year.	Coastwise.			Foreign ports.						Total.		
				American vessels.			Foreign vessels.					
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.
78	116	32,584	850	36	10,218	270	41	19,008	493	193	61,810	1,613
79	148	44,397	1,000	33	8,235	232	40	17,589	468	221	70,221	1,790
80	271	77,656	1,891	36	11,219	317	39	14,996	432	346	103,871	2,041
81	279	100,451	2,239	13	4,174	98	63	30,279	751	355	134,904	3,088
82	335	123,149	2,659	7	2,095	57	63	26,958	694	405	152,202	3,416
83	299	110,302	2,368	11	4,814	107	87	40,765	979	397	155,881	3,454
84	239	88,063	1,893	10	4,434	88	126	62,818	1,435	375	155,315	3,416
85	242	93,280	1,928	10	3,216	76	94	43,284	1,037	346	139,780	3,052
86	229	88,244	1,751	7	3,262	48	98	47,798	1,164	334	139,304	2,835
87	194	86,731	1,625	8	2,251	116	102	54,537	1,232	304	144,519	2,973
88	821	290,590	3,619	9	2,991	76	147	80,830	1,729	977	373,911	10,424
89	220	92,831	1,764	29	10,035	176	191	113,757	2,403	431	216,623	4,343
90	316	196,701	3,844	23	7,513	186	126	71,158	1,559	465	275,372	5,589
91	374	235,565	5,462	29	8,025	164	107	70,228	1,523	501	313,818	6,149
92	439	279,998	4,450	42	20,548	354	134	85,332	1,812	615	385,878	6,616

CLEARED.

Year.	Coastwise.			American vessels.			Foreign vessels.			Total.		
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.
78	124	32,767	874	28	9,231	236	49	21,218	550	201	63,216	1,660
79	157	42,345	1,116	21	7,172	172	47	21,730	555	225	71,247	1,843
80	270	78,913	2,010	14	5,010	115	48	19,970	550	332	103,900	2,675
81	252	82,155	1,732	17	7,218	156	87	42,659	1,014	356	132,932	1,902
82	278	96,170	2,086	19	7,761	170	101	48,699	1,139	398	152,630	3,395
83	257	91,036	1,962	28	11,268	240	124	55,717	1,369	411	158,021	3,571
84	176	62,927	1,322	38	16,209	335	148	70,612	1,633	362	149,478	3,290
85	196	71,345	1,481	21	8,696	190	135	62,437	1,456	352	142,478	3,127
86	184	67,020	1,413	17	7,528	159	117	56,280	1,305	318	130,828	2,877
87	130	51,305	958	5	5,858	143	141	72,894	1,526	276	130,057	2,627
88	785	266,152	8,240	13	4,715	116	173	102,300	2,236	971	373,227	10,592
89	169	65,809	1,273	11	4,266	103	221	130,919	2,830	401	200,994	4,206
90	247	122,820	2,024	18	8,745	165	172	107,197	2,261	437	238,762	4,450
91	313	186,171	3,432	26	16,045	234	141	94,827	1,980	480	297,043	5,646
92	390	247,329	4,228	19	6,882	174	163	109,728	2,334	572	363,939	6,736

Arrivals and clearances of vessels and commerce at Brunswick, Ga.—Continued.

COMMERCE.

Year.	Value of exports.	Value of imports.	Tota-
1878	$1, 372, 842	$400	[illegible]
1879	1, 394, 401	3, 197	[illegible]
1880	1, 702, 570	8, 098	[illegible]
1881	2, 230, 000	4, 377	[illegible]
1882	1, 700, 000	2, 734	[illegible]
1883	3, 437, 000	3, 093	[illegible]
1884	3, 500, 000	958	[illegible]
1885	3, 063, 960	4, 008	[illegible]
1886	2, 828, 656	2, 397	[illegible]
1887	4, 121, 660	*2, 815, 769	[illegible]
1888	7, 552, 025	*3, 140, 231	[illegible]
1889	7, 894, 281	6, 557	[illegible]
1890	7, 355, 841	7, 326	[illegible]
1891	*9, 742, 553	*3, 014, 207	[illegible]
1892	5, 372, 775	22, 983	[illegible]

* Coastwise and foreign.

Comparative statement of receipts and shipments of naval stores.

Year.	Receipts (barrels).						Shipments (barrels).						
	Stock on hand.		Receipts for year.		Total.		Coastwise and interior towns.		Foreign.		Stock on hand.		Tot
	Rosin.	Spirits.	Rosin.	Spirits.	Rosin.	Spirits.	Rosin.	Spirits.	Rosin.	Spirits.	Rosin.	Spirits.	Rosin.
1880	3, 000	600	36, 495	8, 661	39, 495	9, 261	29, 339	8, 371	7, 201	650	2, 935	240	39, 47
1881	2, 935	240	67, 562	13, 490	70, 297	13, 730	37, 029	8, 621	18, 077	3, 009	15, 191	2, 100	70, 29
1882	15, 191	2, 100	104, 357	23, 459	119, 548	25, 559	46, 785	11, 533	52, 972	11, 826	19, 791	2, 200	119, 54
1883	19, 791	2, 200	80, 078	16, 105	99, 769	18, 305	9, 846	5, 183	74, 687	12, 229	15, 236	1, 893	99, 76
1884	15, 236	893	105, 622	23, 449	120, 858	24, 342	22, 859	2, 565	98, 983	20, 167	8, 016	2, 610	120, 85
1885	8, 016	1, 610	92, 958	30, 900	100, 974	22, 510	20, 197	3, 556	68, 814	26, 169	11, 963	2, 785	100, 97
1886	11, 963	2, 786	139, 366	34, 625	151, 329	37, 410	30, 898	15, 620	75, 094	10, 629	45, 337	1, 161	151, 12
1887	45, 337	1, 161	125, 546	32, 338	170, 883	33, 459	22, 356	7, 959	111, 731	23, 986	36, 813	1, 403	170, 8
1888	27, 098	2, 420	140, 820	37, 643	167, 918	40, 063	29, 746	8, 339	120, 159	27, 901	18, 013	3, 823	167, 91
1889	......	......	186, 000	45, 000	......	......	17, 753	6, 889	152, 394	29, 560	31, 869	2, 250	202, 01
1890	31, 869	2, 259	212, 374	42 813	244, 243	45, 072	37, 553	11, 772	145, 406	32, 212	29, 421	1, 088	212, 37
1891	29. 421	1, 088	161, 402	42, 697	190, 823	43, 875	25, 391	5, 640	127, 755	36, 800	30, 294	651	183, 44
1892	30, 294	651	220, 250	52, 496	250, 544	53, 147	42, 575	9, 763	163, 604	39, 181	20, 847	4, 005	227, 0

John H. Deveaux,
Collector of Custo

Capt. O. M. **Carter,**
Corps of Engineers.

N 9.

EXAMINATION OF BRUNSWICK OUTER BAR, GEORGIA, TO DETERMINE RESULT OF WORK DONE BY MR. C. P. GOODYEAR, UNDER ACT OF CONGRESS OF JULY 27, 1892.

[Public—No. 175.]

AN ACT to provide for the improvement of the outer bar of Brunswick, Georgia.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of War be authorized to pay to C. P. Goodyear, his heirs or assigns, upon the procurement by said C. P. Goodyear, his heirs or assigns, of a practicable channel over the outer bar of Brunswick, Georgia.

at least one hundred feet in width, and of a minimum depth of twenty-two feet at ordinary mean high tide, on or before November first, eighteen hundred and ninety-two, the sum of ten thousand dollars; upon the procurement as aforesaid on or before January first, eighteen hundred and ninety-three, of a depth of water in said channel over said outer bar of a minimum depth at ordinary mean high tide of twenty-three feet, ten thousand dollars more, to be paid in manner aforesaid; upon the procurement as aforesaid on or before March first, eighteen hundred and ninety-three, of a depth of water in said channel over said outer bar at a minimum depth at ordinary mean high tide of twenty-four feet, ten thousand dollars more, to be paid in manner aforesaid; upon the procurement as aforesaid on or before May first, eighteen hundred and ninety-three, of a depth of water in said channel over said outer bar of a minimum depth at ordinary mean high tide of twenty-five feet, ten thousand dollars more, to be paid in manner aforesaid; upon procurement on or before October first, eighteen hundred and ninety-three, of a minimum depth in said channel over said outer bar of twenty-six feet at ordinary mean high tide, and of a width of not less than one hundred and twenty-five feet, ten thousand dollars more, to be paid in manner aforesaid; and should the depth of twenty-five feet at ordinary mean high tide in said channel over said outer bar be procured on or before the time aforesaid, and maintained for two years for the width named thereafter, twenty-five thousand dollars in addition, to be paid in manner aforesaid; and and should the depth of twenty-six feet at ordinary mean tide for the width named be procured on or before the date named, and maintained for two years thereafter, twenty-five thousand dollars in addition, to be paid in manner aforesaid. The said C. P. Goodyear, his heirs and assigns, shall perform said work on said outer bar by the explosion of dynamite on the bottom of said channel or sunk beneath the bottom of said channel, in his or their discretion, and not otherwise; and the channel to be deepened as aforesaid shall be north of the present buoyed-out channel, so that said work shall not interfere with the commerce of the port of Brunswick during the progress of such work. The Secretary of War shall detail an officer of engineers to examine and report upon said work from time to time, at such times as the said C. P. Goodyear, his heirs and assigns, announce that they have complied with the conditions as to any of the depths and widths named, or as to the maintenance of depths of twenty-five and twenty-six feet, and payments to be made as aforesaid upon the certificate of such engineer that such depth and width, or such maintenance, has been accomplished in accordance with the provisions of this act. And the money necessary to carry out the provisions of this act is hereby appropriated out of any money in the Treasury not otherwise appropriated.

Approved, July 27, 1892.

TELEGRAM.

WASHINGTON, D. C., *September 28, 1892.*

By direction of the Secretary of War you are detailed to examine and report on the work of C. P. Goodyear on outer bar at Brunswick, Ga., as provided in act of July 27, 1892.

H. M. ADAMS,
Engineers.

Capt. CARTER.

LETTER OF MR. C. P. GOODYEAR.

BRUNSWICK, GA., *November 2, 1892.*

SIR: I have the honor to advise you that I am ready for a survey under the act of Congress passed at the last session, under the provisions of which I have been at work deepening the outer bar of Brunswick, Ga., with dynamite, and claim 22 feet of water obtained under the terms of said bill, and ask for a survey preliminary to receiving a certificate to that effect, so as to receive the first payment provided under said act for a 22-foot depth.

Very respectfully,

C. P. GOODYEAR.

Capt. O. M. CARTER,
United States Engineer.

REPORT OF CAPT. O. M. CARTER, CORPS OF ENGINEERS, ON 22-FOOT DEPTH.

UNITED STATES ENGINEER OFFICE,
Savannah, Ga., December 16, 1892.

GENERAL: I have the honor to submit herewith my report on a examination of Brunswick Outer Bar, Georgia, made with a view o determining the results, if any, of the work done by Col. C. P. Goodyear prior to November 2, 1892, as contemplated by act of Congres dated July 27, 1892, and in accordance with a telegram from the Chie of Engineers dated September 28, 1892.

Preparations were made for the examination during the latter par of October, when the necessary party and material were assembled stations and gauges established, buoys located, and the locality of th work defined. As soon as possible after the receipt of a notificatio from Col. Goodyear, dated November 2, 1892, that the required dept was obtained, the actual examination was begun and continued, as th weather permitted, until completed. The bar was covered with line of soundings from 10 to 30 feet apart in two directions, crossing eac other at right angles; and, in addition, lines were run following th channel defined by Col. Goodyear and marked by him with buoys The lead line was read to the nearest tenth of a foot, and was teste at the beginning and ending of each day's work by comparison with a steel tape. The tide gauge established at the ocean pier on St. Simo Island was read every five minutes while the work was in progres and every sounding was corrected for the stage of tide and error o graduation to reduce it to the depth at mean low water. The soundings were located by two transits on shore stations so situated as t give good intersections over the area to be covered. There were take in all, during the month of November, 6,955 soundings, 1,356 of whic were instrumentally located. This work was plotted on a scale of 5 feet to the inch, and from the original a tracing was prepared showin characteristic soundings and curves of equal depth for every 12 inche from 12 to 18 feet. Soundings are expressed in feet and tenths, and refer to the plane of mean low water as determined by the survey o Brunswick Outer Bar, 1890-'91. The mean rise and fall of the tide, a determined by the same survey, is 6.64 feet, and this is to be added t the depths given on the map to obtain the depths at mean high water. The mean low-water plane and the mean rise and fall of tide were determined by a five months' continuous record of a self-registerin tide gauge at the ocean pier, St. Simon Island, during the survey o 1890-'91.

The plane of mean low water to which are referred the soundings on the charts of the U. S. Coast and Geodetic Survey is 0.1 of a foot lower than the plane here used, and the mean rise and fall of the tide, as given on those charts and in the tide tables for St. Simon Entrance, is 6.8 feet. Therefore, to reduce the soundings of this examination to depth at mean high water of the Coast and Geodetic Survey, 6.7 feet should be added. No other authentic determination of the mean low-water plane and of the mean rise and fall of the tide can be found, and as the two values mentioned above give results for the depths at mean high water differing only 0.06 of a foot, it is practically immaterial which one of the two is used.

The present channel across the bar is marked by two red buoys, numbered 4½ and 4, respectively. South of buoy No. 4½ is a deep pocket that pierces the inner side of the bar nearly half its width, with depths of 16 feet and more at mean low water, reaching to within 700 feet of the 16-foot curve outside the bar, measured on the shortest line.

North of buoy No. 4½ is a shoal on which the depth is less than 12 feet at mean low water. A spur from the deep pocket just mentioned extends to the northeast on the outer side of this shoal and carries over 15 feet at mean low water for a distance of about 600 feet. The extension of this spur on a line curving to the eastward into deep water is the channel claimed by Col. C. P. Goodyear to be 22 feet in depth at mean high tide. It is marked by two pairs of buoys placed by Col. Goodyear, and is, in fact, the deepest channel crossing the bar, but it does not carry the depth claimed by him.

The mean rise and fall of the tide is 6.64 feet, and a channel carrying 22 feet at mean high water would be 15.36 feet at mean low water. The plotted soundings show that nowhere across the bar is there a channel of this depth, and that the best channel 100 feet wide contains depths of 13.8 feet, with 13.5 feet near its edges. The thread of this channel carries, in crossing its shoalest portion, not less than 14 feet at mean low water. The shoalest water is found just before reaching deep water outside the bar, and the shoalest soundings are on lumps that are surrounded by depths exceeding 14 feet. A few holes are found where the depth is 15 feet or more.

On the line of the channel now used south of Buoy No. 4, a width of 100 feet will include depths of from 13.3 to 13.5 feet at mean low water over the shoalest portions, and the 14-foot curves are not broken through here as they are in the more northerly channel. Taking 14 feet as the greatest depth at mean low water in the thread of the new channel at its shoalest point, there results a depth of 20.64 feet at mean high water of the survey of Brunswick Outer Bar, 1890–'91, or a depth of 20.7 feet at mean high water of Coast and Geodetic Survey charts and tide tables. The lumps that are found in the 100-foot channel reduce the available mean high water depth to 20.5 feet at the best.

In view of the facts here presented, I am unable to certify that the provisions of the act of Congress dated July 27, 1892, in so far as they relate to the depth of channel required on or before the 1st day of November, 1892, have been fulfilled.

A map* showing the results of the examination is submitted herewith.

Very respectfully, your obedient servant,

O. M. CARTER,
Captain, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

LETTER OF MR. C. P. GOODYEAR.

BRUNSWICK, GA., *January 2, 1893.*

DEAR SIR: I have the honor to request that Capt. O. M. Carter, Corps of Engineers, U. S. Army, heretofore detailed to inspect the work being prosecuted by me upon the outer bar of Brunswick, Ga., under authority of an act of Congress, in the form of a contract with me for deepening said bar, be notified to make such survey as may be necessary to determine whether I have 23 feet of water at mean high tide.

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* Not printed.

I claim that I have procured such depth under the provisions of said act of Congress which was approved July 28, 1892.

Yours, very respectfully,

O. P. GOODYEAR.

Hon. S. B. ELKINS,
Secretary of War.

[First indorsement.]

OFFICE CHIEF OF ENGINEERS,
U. S. ARMY,
January 6, 1893.

Copy respectfully furnished Capt. O. M. Carter, Corps of Engineers, for his information in connection with telegram of this date on the same subject.

By command of Brig. Gen. Casey.

H. M. ADAMS,
Major, Corps of Engineers.

TELEGRAM.

WASHINGTON, D. C., *January 6, 1893.*

Goodyear claims 23 feet on outer bar at Brunswick. Make complete survey and report result as soon as possible.

CASEY,
Chief of Engineers.

Capt. CARTER.

REPORT OF CAPT. O. M. CARTER, CORPS OF ENGINEERS, ON 23-FOOT DEPTH.

UNITED STATES ENGINEER OFFICE,
Savannah, Ga., January 30, 1893.

GENERAL: I have the honor to submit herewith my report on an examination of the outer bar at Brunswick, Ga., made in compliance with instructions contained in a telegram from the Chief of Engineers, U. S. Army, dated January 6, 1893, and with a view to determining the results, if any, of the work done by Mr. C. P. Goodyear prior to January 2, 1893, as contemplated by act of Congress dated July 27, 1892.

The examination was begun as soon as possible after instructions were received from the Chief of Engineers and was continued, as the weather permitted, until completed. The bar was covered with lines of soundings in two directions, crossing each other as nearly at right angles as possible; in addition, lines were run following the channel defined by Mr. Goodyear and marked by him with buoys. The field and office methods pursued in making this examination were identical with those adopted in the examination of November, 1892, and are described in detail in my report of December 16, 1892, to which I respectfully refer.

The deepest channel across the bar in January, 1893, is found to be in practically the same position as in November, 1892, namely, beginning inside the bar in deep water south of Buoy No. 4½, and extending easterly to the north at Buoy No. 4; thence curving sharply to the southeast to reach deep water outside the bar.

The principal changes in this channel since November are a widening at its shoalest point, and a general leveling of the bottom, with a resulting slight increase in the available depth. Lumps on which were found in November depths of from 13.7 to 13.9 feet have disappeared, and holes giving in that month depths of 15 feet or more have been filled, so that the depth at the shoalest point of the best 100-foot channel is now not less than 14 feet at mean low water. About 100 feet seaward of the shoalest point the outer slope of the bar is reached and a depth of 16 feet at mean low water found. Shoreward, on the line of the channel, the depths gradually increase, 15 feet being found midway between Buoys No. 4 and No. 4½, and 16 feet just south of Buoy No. 4½.

The 14-foot curves north and south of the channel which in November were separated on the crest of the bar by only about 40 feet, are now more than 100 feet apart. At no other point is there a 14-foot channel across the bar, although the outer and inner curves approach within 100 feet of each other south of Buoy No. 4.

The principal shoals and deep-water pockets are practically the same as in November, except that the outer 15-foot curve south of Buoy No. 4 shows a shoreward indentation; further to the south is found a similar indentation in the 14-foot curve. Minor changes in the positions of curves of equal depth are due perhaps as much to inaccuracies in the soundings, locations, and reductions as to actual changes in depths.

Errors in soundings may arise in estimating the tenths of a foot between foot marks, and from the swell ever present on an ocean bar. Errors in location may occur from spacing the soundings at equal intervals between located points when the actual intervals may vary from uniformity; and errors in reduction may occur from the unknown effect of wind, etc., in the propagation of the tidal wave. Owing to those sources of error the soundings as plotted may vary by 3 or 4 tenths of a foot from the true depths, and it is only where several soundings at or near the same point give nearly the same reduced depth that their accuracy can be relied upon.

The work of Mr. Goodyear on this bar was originally begun on a line coinciding with the axis of the outer end of the present 100-foot channel, and extending thence northeasterly toward the St. Simon Hotel. The location of the work was afterward shifted to the west, to enter the deep water south of Buoy No. 4½ and avoid the shoal northeast of that buoy.

This was the line defined by him at the examination in November, 1892. Since then another change in the location of the work has been made, and the channel claimed was defined by him as lying south of and within 300 feet of buoy No. 4½, extending easterly and passing within 150 feet of buoy No. 4 to deep water outside the bar. Little or nothing was found to indicate that any work had been done on that range, and the best 100-foot channel is still to be found on the second line adopted by him.

Buoy No. 4 as now plotted is from 50 to 75 feet northwest of its former position, it having been accidentally dragged, as I was informed, by the tugboat in tow of a scraper or harrow used by Mr. Goodyear to level the bottom and increase the depths on the bar.

The act of July 27, 1892, requires the procurement by Mr. Goodyear, on or before January 1, 1893, by the explosion of dynamite alone, of a depth of water in a channel 100 feet wide over the outer bar at Brunswick, Ga., "of a minimum depth at ordinary mean high tide of 23 feet." This is equivalent to a depth of 16.3 feet at mean low water. The actual mean low-water depth in the best channel 100 feet wide across the bar, as shown by the examination just completed, is only 14 feet at its shoalest point.

In view of all the facts herein presented, I am unable to certify that the provisions of the act of Congress dated July 27, 1892, in so far as they relate to the depth of channel required on or before the 1st day of January, 1893, have been fulfilled.

A chart* showing the results of the examination is transmitted herewith.

Very respectfully, your obedient servant,

O. M. CARTER,
Captain, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

N 10.

IMPROVEMENT OF JEKYL CREEK, GEORGIA.

Jekyl Creek forms a part of the inside passage between Savannah River, Georgia, and St. Johns River, Florida. It connects St. Simons Sound and Brunswick River at the north with Jekyl and St. Andrew sounds at the south. The creek is about 5 miles in length, is separated from the Atlantic Ocean by Jekyl Island, and debouches into Brunswick River about 6 miles from the town of Brunswick, Ga.

Operations for the improvement of this creek have been carried on in accordance with a project of improvement prepared by Gen. Gillmore, the officer then in charge, and printed as Appendix N 10, Annual Report of the Chief of Engineers for 1888.

ORIGINAL CONDITION.

With the exception of two points, the creek has ample widths and depths to accommodate the largest class of vessels that take the inside route. About a mile from its northern end a shoal is found between the points where Lathram and Mud rivers enter the creek, and from the mouth of the creek to the deep waters of Brunswick River, in the bight formed by the southern shore of the latter, there is an extensive mud flat. The least mean low-water depth across at the mouth of the creek was 3.7 feet. Across the shoal between Lathram and Mud rivers it was 3 feet. The mean rise and fall of tide is 7.1 feet.

PLAN OF IMPROVEMENT.

The following comprise the main features of the plan of improvement:

(1) A training wall at the mouth of the creek, designed to guide the ebb currents across the mud flats to the deep waters of Brunswick River.

(2) Closing Mud River by means of a dam at some suitable point to prevent the escape of water through that branch at ebb tide.

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* Not printed.

(3) Dredging through the mud flats at the mouth of Jekyl Creek and in the creek proper, near the mouth of the river.

The training wall and closing dam were to be constructed of log and brush mattresses, or brush fascines, and riprap stone below the level of low water; above that point stone alone was to be used. It was proposed to give the dredged channel a bottom width of 50 feet. The works were intended to establish and maintain a 7-foot low-water channel through the shoals.

The cost of the project was estimated at $38,590.

SUMMARY OF OPERATIONS PRIOR TO JULY 1, 1892.

From May 13 to June 8, 1891, the foundation course of the training wall was laid 40 feet in width and 513.5 feet in length. There were used in this work 2,282.22 square yards of mattresses, 336.18 cubic yards of stone, and 28.17 cubic yards of fascines.

There were removed by dredging 7,940.51 cubic yards of material inside of the creek and 25,546.33 cubic yards from the shoal outside the mouth, making a cut 7 feet deep at mean low water through it. Altogether there were therefore removed by dredging at various times 33,486.84 cubic yards of material.

Up to July 1, 1892, the total expenditures for the work, including outstanding liabilities, amounted to $12,488.01.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1893.

Jetty work under contract awarded March 1, 1893, to the Atlantic Contracting Company was commenced on May 24 and continued to the end of the fiscal year. About 200 linear feet of the old part of the training wall were built up to about 2 feet above mean low water, and altogether the training wall was extended as follows: First course, 1,495.3 feet; second course, 1,942.2 feet; third course, 1,719.7 feet; fourth course, 140 feet; fifth course, 130 feet; sixth course, 90 feet. There were used in this work during the year 17,170.97 square yards of brush mattresses and 1,252.51 cubic yards of riprap stone.

CONDITION OF WORK JUNE 30, 1893.

The training wall is in good condition.

No dredging has been done during the year. A narrow 6-foot channel follows the direction of the training wall to its outer end; thence over the shoal the least depth is 5½ feet. The 5-foot curve is continuous over the shoal.

COMMERCE AND NAVIGATION.

The commercial value of the annual traffic through Jekyl Creek is estimated at about $1,000,000, and the amount of freight carried at about 30,000 tons. It is impossible to secure accurate figures because most of the freight is billed by the package and no records of the weights and values are kept. The above estimate is, however, believed to be a close approximation to the truth. The freights through the channel, outward from the cities of Savannah, Brunswick, and Fernandina, consist mainly of general merchandise and mill supplies. The inward freights are cotton, naval stores, rice, fish, etc.

Tabular statement of commerce on Jekyl Creek.

Route.	Between—	No. of steamers.	Towing—	Trips.	Freight.	Value.
					Tons.	
Savannah	Savannah and Brunswick	1		Weekly		$7,0
Sea Island	Savannah and Fernandina	1	1 barge	Biweekly	26,500	900,0
Cumberland	Brunswick and Fernandina	1		Daily	600	17,0
Satilla River	Brunswick and Satilla River	1		Triweekly	1,400	45,
Jekyl Island	Brunswick and Jekyl Island	1		Daily	1,700	50,
Total		5			30,200	1,019,0

Vessels passing through adjacent ports are often towed throug Jekyl Creek, thus avoiding rough weather at sea and the necessity o taking in ballast.

The steamers on the Cumberland route and the Jekyl Island rout are passenger boats and carry but little freight. In addition to th boats above mentioned, many small craft carrying rice, farm an garden produce, fish and oysters, pass through this channel.

Owing to the shoal water in Jekyl Creek, the steamers passin through on their regular trips are often delayed several hours whil waiting for a suitable stage of tide, and some are reported to have su tained injuries by running aground. The Cumberland route is a par of a through passenger line to Florida via the East Tennessee, Vi ginia and Georgia Railway, and the delays mentioned interrupt th schedule to the detriment of the passenger service.

The completion of the works of improvement will undoubtedly b followed by a large increase in the amount of commerce passing throug Jekyl Creek.

MISCELLANEOUS.

The work is located in the collection district of Brunswick, Ga. Amount of duti collected in 1892, $6,408.15. St. Simons Light, is the nearest light-house, and Fo Clinch, Fla., the nearest fort.

The following appropriations have been made for this work:

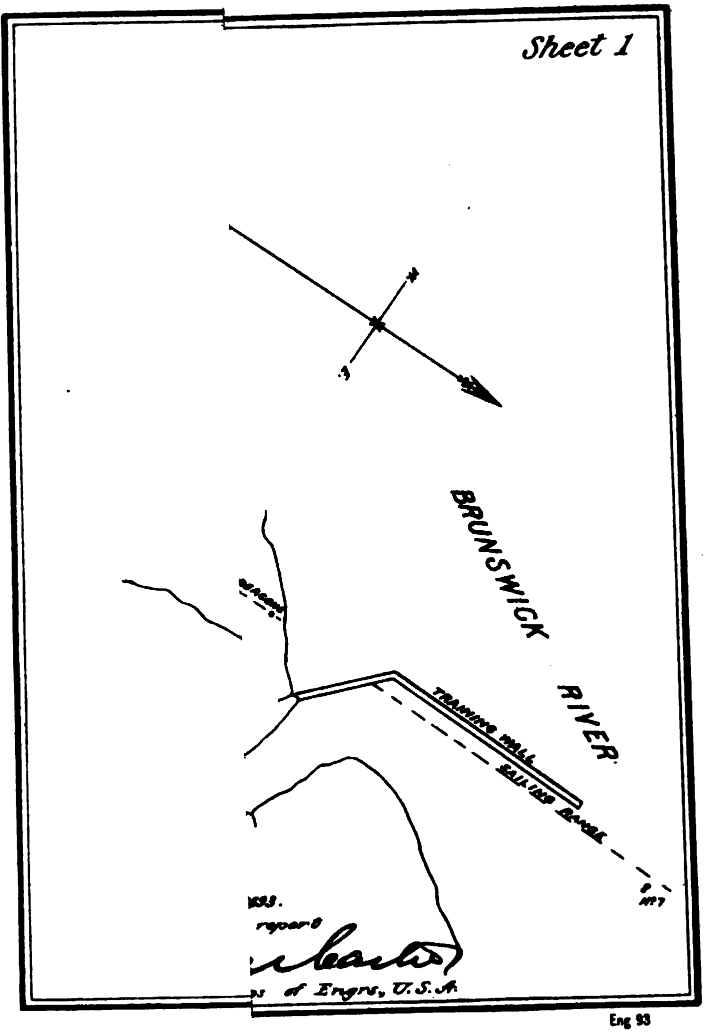
By act of Congress of—	
August 11, 1888	$5,00
September 19, 1890	7,5
July 13, 1892	7,5
Total	20,00

In addition to this the sum of $15,000, appropriated for "improvi inside water route between Savannah, Ga., and Fernandina, Fla.," wa expended during the year at Jekyl Creek.

The irregular and inadequate appropriations heretofore made fo this improvement have so increased its cost that, as recommended i my report of November 25, 1891, the original estimate of cost must b increased by more than $16,000.

It is estimated that the sum of $18,590 is necessary to complete thi improvement. This amount can be economically and advantageousl expended during the coming fiscal year. Unless the total amount i made available, the cost of the work will be still further increased.

The total expenditures to June 30, 1893, including all outstanding liabilities, were $19,811.08.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wick, Ga., "of a minimum depth at ordinary mean high tide of 2 feet." This is equivalent to a depth of 16.3 feet at mean low wate. The actual mean low-water depth in the best channel 100 feet wid across the bar, as shown by the examination just completed, is only 1 feet at its shoalest point.

In view of all the facts herein presented, I am unable to certify th the provisions of the act of Congress dated July 27, 1892, in so far a they relate to the depth of channel required on or before the 1st da of January, 1893, have been fulfilled.

A chart* showing the results of the examination is transmitted here with.

Very respectfully, your obedient servant,

O. M. CARTER,
Captain, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

N 10.

IMPROVEMENT OF JEKYL CREEK, GEORGIA.

Jekyl Creek forms a part of the inside passage between Savanna River, Georgia, and St. Johns River, Florida. It connects St. Simo Sound and Brunswick River at the north with Jekyl and St. Andre sounds at the south. The creek is about 5 miles in length, is separate from the Atlantic Ocean by Jekyl Island, and debouches into Brun wick River about 6 miles from the town of Brunswick, Ga.

Operations for the improvement of this creek have been carried o in accordance with a project of improvement prepared by Gen. Gillmore, the officer then in charge, and printed as Appendix N 10, Annua Report of the Chief of Engineers for 1888.

ORIGINAL CONDITION.

With the exception of two points, the creek has ample widths an depths to accommodate the largest class of vessels that take the insid route. About a mile from its northern end a shoal is found betwee the points where Lathram and Mud rivers enter the creek, and fro the mouth of the creek to the deep waters of Brunswick River, in th bight formed by the southern shore of the latter, there is an extensiv mud flat. The least mean low-water depth across at the mouth of th creek was 3.7 feet. Across the shoal between Lathram and Mud river it was 3 feet. The mean rise and fall of tide is 7.1 feet.

PLAN OF IMPROVEMENT.

The following comprise the main features of the plan of improvement:

(1) A training wall at the mouth of the creek, designed to guide th ebb currents across the mud flats to the deep waters of Brunswick River.

(2) Closing Mud River by means of a dam at some suitable point to prevent the escape of water through that branch at ebb tide.

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* Not printed.

(3) Dredging through the mud flats at the mouth of Jekyl Creek and in the creek proper, near the mouth of the river.

The training wall and closing dam were to be constructed of log and brush mattresses, or brush fascines, and riprap stone below the level of low water; above that point stone alone was to be used. It was proposed to give the dredged channel a bottom width of 50 feet. The works were intended to establish and maintain a 7-foot low-water channel through the shoals.

The cost of the project was estimated at $38,590.

SUMMARY OF OPERATIONS PRIOR TO JULY 1, 1892.

From May 13 to June 8, 1891, the foundation course of the training wall was laid 40 feet in width and 513.5 feet in length. There were used in this work 2,282.22 square yards of mattresses, 336.18 cubic yards of stone, and 28.17 cubic yards of fascines.

There were removed by dredging 7,940.51 cubic yards of material inside of the creek and 25,546.33 cubic yards from the shoal outside the mouth, making a cut 7 feet deep at mean low water through it. Altogether there were therefore removed by dredging at various times 33,486.84 cubic yards of material.

Up to July 1, 1892, the total expenditures for the work, including outstanding liabilities, amounted to $12,488.01.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1893.

Jetty work under contract awarded March 1, 1893, to the Atlantic Contracting Company was commenced on May 24 and continued to the end of the fiscal year. About 200 linear feet of the old part of the training wall were built up to about 2 feet above mean low water, and altogether the training wall was extended as follows: First course, 1,495.3 feet; second course, 1,942.2 feet; third course, 1,719.7 feet; fourth course, 140 feet; fifth course, 130 feet; sixth course, 90 feet. There were used in this work during the year 17,170.97 square yards of brush mattresses and 1,252.51 cubic yards of riprap stone.

CONDITION OF WORK JUNE 30, 1893.

The training wall is in good condition.

No dredging has been done during the year. A narrow 6-foot channel follows the direction of the training wall to its outer end; thence over the shoal the least depth is 5½ feet. The 5-foot curve is continuous over the shoal.

COMMERCE AND NAVIGATION.

The commercial value of the annual traffic through Jekyl Creek is estimated at about $1,000,000, and the amount of freight carried at about 30,000 tons. It is impossible to secure accurate figures because most of the freight is billed by the package and no records of the weights and values are kept. The above estimate is, however, believed to be a close approximation to the truth. The freights through the channel, outward from the cities of Savannah, Brunswick, and Fernandina, consist mainly of general merchandise and mill supplies. The inward freights are cotton, naval stores, rice, fish, etc.

Tabular statement of commerce on Jekyl Creek.

Route.	Between—	No. of steamers.	Towing—	Trips.	Freight.	Valu
					Tons.	
Savannah	Savannah and Brunswick	1		Weekly		$7
Sea Island	Savannah and Fernandina	1	1 barge	Biweekly	26,500	90
Cumberland	Brunswick and Fernandina	1		Daily	600	17
Satilla River	Brunswick and Satilla River	1		Triweekly	1,400	45
Jekyl Island	Brunswick and Jekyl Island	1		Daily	1,700	50
Total		5			30,200	1,019

Vessels passing through adjacent ports are often towed throu Jekyl Creek, thus avoiding rough weather at sea and the necessity taking in ballast.

The steamers on the Cumberland route and the Jekyl Island rou are passenger boats and carry but little freight. In addition to t boats above mentioned, many small craft carrying rice, farm a garden produce, fish and oysters, pass through this channel.

Owing to the shoal water in Jekyl Creek, the steamers passi through on their regular trips are often delayed several hours wh waiting for a suitable stage of tide, and some are reported to have s tained injuries by running aground. The Cumberland route is a pa of a through passenger line to Florida via the East Tennessee, V ginia and Georgia Railway, and the delays mentioned interrupt t schedule to the detriment of the passenger service.

The completion of the works of improvement will undoubtedly b followed by a large increase in the amount of commerce passing throu Jekyl Creek.

MISCELLANEOUS.

The work is located in the collection district of Brunswick, Ga. Amount of dut collected in 1892, $6,408.15. St. Simons Light, is the nearest light-house, and F Clinch, Fla., the nearest fort.

The following appropriations have been made for this work:

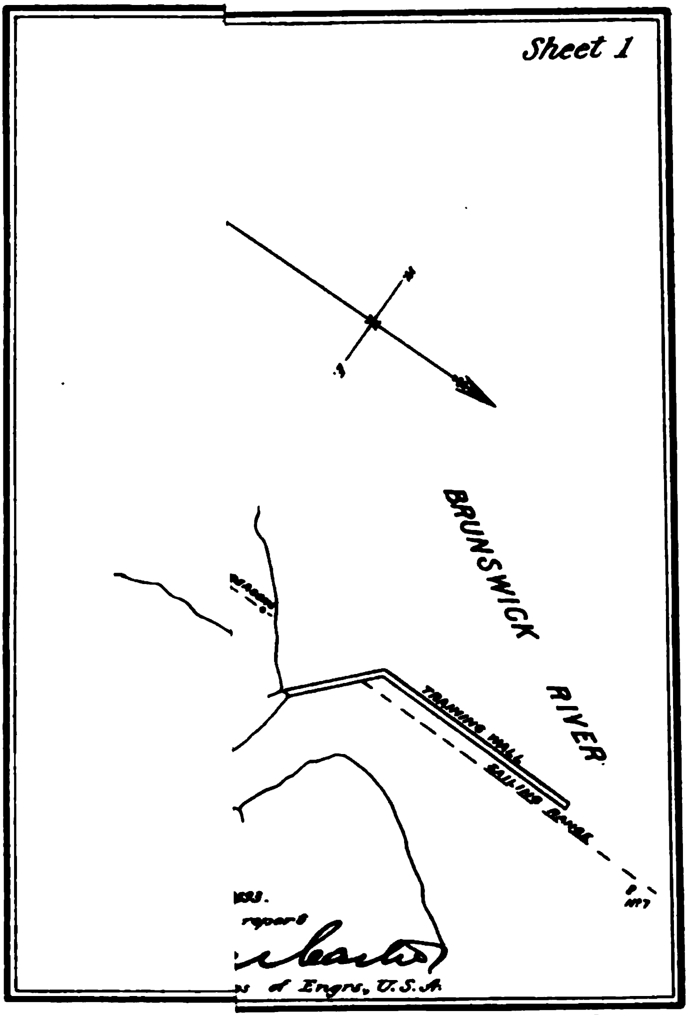
By act of Congress of—	
August 11, 1888	$5,
September 19, 1890	7,
July 13, 1892	7,
Total	20,

In addition to this the sum of $15,000, appropriated for "improvi inside water route between Savannah, Ga., and Fernandina, Fla.," w expended during the year at Jekyl Creek.

The irregular and inadequate appropriations heretofore made f this improvement have so increased its cost that, as recommended i my report of November 25, 1891, the original estimate of cost must b increased by more than $16,000.

It is estimated that the sum of $18,590 is necessary to complete th improvement. This amount can be economically and advantageous expended during the coming fiscal year. Unless the total amount i made available, the cost of the work will be still further increased.

The total expenditures to June 30, 1893, including all outstanding liabilities, were $19,811.08.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Money statement.

July 1, 1892, balance unexpended	$51.99
Amount appropriated by act approved July 13, 1892	7,500.00
	7,551.99
June 30, 1893, amount expended during fiscal year	3,729.79
July 1, 1893, balance unexpended	3,822.20
July 1, 1893, outstanding liabilities	3,633.28
July 1, 1893, balance available	188.92
Amount (estimated) required for completion of existing project	18,590.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	18,590.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867, and of sundry civil act of March 3, 1893.	

Abstract of proposals for improving Jekyl Creek, Georgia, and inside water route between Savannah, Ga., and Fernandina, Fla., opened on February 7, 1893, by Capt. O. M. Carter, Corps of Engineers.

No.	Name and address of bidder.	Mattresses 9,000 square yards.		Riprap stone, 3,000 cubic yards.		Total.
		Price.	Amount.	Price.	Amount.	
1	The Atlantic Contracting Co., John F. Gaynor, New York, N. Y., President*	$0.99	$8,910.00	$3.59	10,770.00	$19,680.00
2	Colin McK. Grant, Charleston, S. C	1.25	11,250.00	3.70	11,100.00	22,350.00

* Bid recommended for acceptance, they being the lowest responsible bidders for the best and most suitable materials and services.

Amount available, $21,000.

N 11.

IMPROVEMENT OF CUMBERLAND SOUND, GEORGIA.

The entrance to Cumberland Sound is situated between Cumberland Island, Georgia, and Amelia Island, Florida.

Operations for improving the channel across the bar at this entrance have hitherto been carried on in accordance with a project of improvement submitted to the Chief of Engineers by Gen. Gillmore, the officer then in charge, dated June 30, 1879. A discussion of the general question of the application of jetties to this entrance is published as Appendix H 6, Annual Report of the Chief of Engineers for 1878.

For a detailed history of past work, see page 1054, Annual Report of the Chief of Engineers for 1888.

ORIGINAL CONDITION.

The available depth of the entrance in its unimproved condition varied from 11 to 12.5 feet at mean low water. The mean rise and fall of tide is 5.9 feet.

PLAN OF IMPROVEMENT.

The plan of improvement, as originally submitted by Gen. Gillmore in 1879 and revised by the Board of Engineers in March, 1891, provides for the construction of two low jetties, composed of riprap stone, w a mattress hearting whenever admissible, resting upon a foundat mattress of brush or logs and brush, starting, respectively, from shores on opposite sides of the entrance and extending seaward acr the bar upon lines so directed that the ends will be parallel to e other and about 3,900 feet apart. These jetties are intended to es lish a low-water channel across the bar not less than 19 feet in dep The cost of the improvement was originally estimated at $2,071. and, as modified, at $1,606,500 for the completion of the low jetties at $2,079,500 if high jetties are found necessary.

SUMMARY OF OPERATIONS PRIOR TO JULY 1, 1892.

Nothing was ever expended in improving the entrance to Cumb land Sound previous to the adoption of the existing project. Si then appropriations have been made by Congress for the work, ag gating $762,500.

North jetty.—The shore end of this jetty is located on Cumberl Island, about 7,700 feet N., 26° 30′ W., from the eastern bastion of F Clinch. From this point it extends S. 61° 30′ E. 2,200 feet to the ou end of the first range, thence S. 80° E. 10,529.7 feet to the outer en the second range, thence N. 82° E. to its seaward end (third ran Work on this jetty was commenced in June, 1881, and suspended March, 1883. Operations were resumed on June 23, 1891, and we suspended on November 14, 1891. At this time the foundation cou had been extended from the shore end of the jetty to a point 13,7 feet from it, as measured on the axis of the jetty, excepting for a sp of 1,031.4 feet between Station 8762.7 and Station 9794.1, where a g was left across a shoal that rises above mean low-water level. The in end of the outer or seaward (third) range was reached at Station 1272

In addition to the foundation course a second course had been bu extending from the outer end of the first range 1,439 feet shorewa

Foundation courses of two spurs each 54 feet in length had also be laid on the harbor side of the jetty at distances of 1,627 and 1,800 fe from the shore end.

The mattresses of the foundation course vary in width from 25 to feet as far out as about Station 7275; thence outward they are 100 fe in width. The mattresses of the second course vary in width from to 25 feet; the spurs are 42 feet wide. The mattresses are from 19 22 inches thick and are loaded with riprap stone.

There have been used in this work 108.008.96 square yards of bru mattresses and 27,424.31 cubic yards of riprap stone.

South jetty.—The shore end of this jetty is located on Amelia Islan about 5,800 feet E. 18° S. from the eastern bastion of Fort Clin From this point it extends seaward a distance of 10,062.48 feet, mea ured along the axis of the work. From the initial point it runs as fo lows, viz:

	Feet
Range 1, E	2,041.
Range 2, N. 68° 32′ E	5,62
Range 3, N. 69° 32′ E	400
Range 4, N. 71° 32′ E	400
Range 5, N. 78° 32′ E	400
Range 6, N. 78° 32′ E	400
Range 7, N. 80° 2′ E	400
Range 8, N. 81° E	395.

In addition to the foundation course a second course 3,967.9 feet length extends seaward along the second range, beginning at a poi 917.7 feet from the intersection of the first and second ranges.

The mattresses of the foundation course vary in width on the first range from 40 to 50 feet and on the second range from 50 to 100 feet. On all other ranges their width is 100 feet, as is also that of the mattresses of the second course. The mattresses average about 18 inches in thickness and are loaded with riprap stone to an average depth of 12 inches. This jetty has been brought up to the level of mean low water for a distance of nearly 3,123 feet from its shore end, and with a crest width of 16 feet shoreward of the angle and of 22 feet seaward of that point. The structure consists of riprap stone upon the mattress foundation. A hearting of oyster shells was tried, but being found to be disadvantageous and not economical was discontinued. The stone has stood well, the slopes assumed on both sides of the jetty being about 1 on 1-¼. No breaking down of the work at any point has been observed. There have been used in the work 145,197.86 square yards of mattresses, 74,010.47 cubic yards of riprap stone, and 2,071.80 cubic yards of oyster shells.

Up to July 1, 1892, the total expenditures on both jetties, including outstanding liabilities, amounted to $59,624.8.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1893.

Operations on the north jetty were recommenced October 31, 1892, under contract with Edward H. Gaynor, awarded September 16, 1892, and were suspended on May 19, 1893, the funds available being exhausted.

On the third range the foundation course, composed of mattresses 100 feet in width and loaded with riprap stone, was extended 3,698.6 feet from Station 13717.9 to Station 17416.5, and the second course, composed of mattresses 80 and 90 feet wide, and loaded with riprap stone, was extended 4,686.8 feet from Station 12729.7 to Station 17416.5. The work on these two courses was done by single mats as far out as Station 14930.6 on the first, and Station 14931.5 on the second course. Thence out to Station 17416.5 the two courses were advanced together by means of double mats. Besides this, the second course, composed of mattresses 80 feet wide and loaded with riprap stone, was extended on the second range, 2,209.6 feet, from Station 10520.1 to Station 12729.7, or the outer end of the second range. One mattress, 80 feet wide and loaded with riprap stone, was laid in the third course, between Stations 12514.9 and 12609.8, a distance of 94.9 feet. All distances are measured along the axis of the jetty and from the initial point, or shore end of the same.

In the work, during the fiscal year just closed, there were used 107,734.92 square yards of brush mattresses and 13,683.63 cubic yards of riprap stone, making a net advance of 3,698.6 feet in the foundation course, 6,896.4 feet in the second course, and 94.9 feet in the third course.

CONDITION OF WORK JUNE 30, 1893.

Examinations of the work and of the bar channel were made in March and in June, 1893. The jetties have received no injury during the year and are in good condition. From the shore end to a point about 3,800 feet from it the crest of the south jetty is on the average up to mean low water. Beyond this point the depth on the crest raises from about 10 to about 16 feet at mean low water. On the shore end of the north jetty the depth on the crest varies between 3 and 6 feet. Between the first and the second angle point it varies between 1 and 5 feet. From the second angle point to about 3,000 feet beyond it averages abo feet, and thence to the end of the jetty it varies between 6 and 10

The channel remains in about the same position as last year crosses the south jetty and then extends seaward in an almost due erly direction, the available depth over the bar being about 13 fe

COMMERCE AND NAVIGATION.

All the commerce of St. Marys, Ga., and 90 per cent of the comm of Fernandina, Fla., are dependent upon water transportation thr Cumberland Sound.

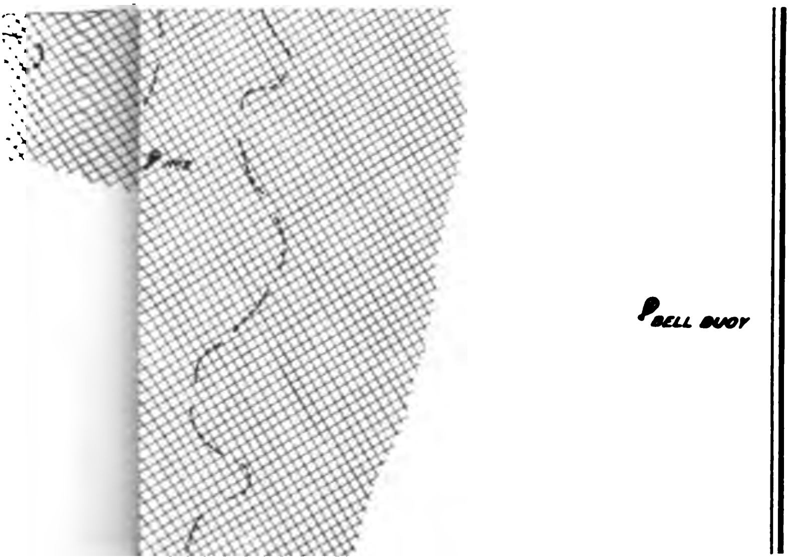
The Florida Central and Peninsular Railroad, terminating at Fe dina, besides traversing a fertile and well-timbered country, pi also the Florida phosphate fields, and much of the rock from the phate mines is brought by this road to Fernandina for shipme coastwise and foreign ports. For the handling of this increased t the railroad has built new wharves, erected a large elevator, an tended its terminal facilities. From information derived from owners of the principal mines it is estimated that the annual shipm of rock will aggregate about 300,000 tons.

The Mallory line has two steamships per week plying between nandina and New York, which carry annually about 61,000 to freight. Fifteen steamers per week ply between Fernandina and coastwise ports, and a large fleet of foreign and coastwise vess engaged in the commerce of this port.

In 1892 the shipments, foreign and coastwise, amounted to 26 tons, valued at $2,482,393, and the receipts by water were 25,580 valued at $6,500,000.

Shipments and receipts, port of Fernandina, Fla., 1892.

Articles.	Quantity.	Tons.	V
SHIPMENTS.			
Foreign:			
Lumber .... feet..	10,792,390	21,585	$1
Phosphate rock .... tons..	....	119,546	1, 1
Shingles .... mills..	220,150	80	
Oranges .... boxes..	10,500	420	
Coastwise:			
Lumber .... feet..	54,480,461	108,960	6
Phosphate rock .... tons..	....	5,412	
Cotton (sea island) .... bales..	2,470	530	1
Rosin .... barrels..	7,505	1,500	
Spirits of turpentine .... do....	834	208	
Cedar in cases	8,434	2,530	1
Cedar in blocks	7,783	800	
Shingles .... mills..	9,000,000	3,600	
Palmetto fiber	....	50	
Creosoted lumber and piles .... feet..	217,000	651	
Cotton-seed oil .... barrels..	2,217	550	
Oysters and fish .... cases..	8,284	208	
Total	....	266,630	2, 4
RECEIPTS.			
Steel rails	....	4,680	1
Guano	....	4,500	1
Coal	....	2,400	
Salt	....	1,000	
Merchandise	....	13,000	6,
Total	....	25,580	6,
Aggregate	....	292,110	9, 2


BELL BUOY

MISCELLANEOUS.

This work is located in two collection districts, the north jetty being in the dis- ict of St. Marys, Ga., and the south jetty in that of Fernandina, Fla. Fernandina, a., is the nearest port of entry. Amount of duties collected at Fernandina in 1892, ,604.22; at St. Marys, none. Amelia Light is the nearest light-house and Fort inch, Fla., the nearest fort.

Since the existing project for improving Cumberland Sound was lopted the following appropriations have been made for this work:

act of Congress of—	
June 14, 1880	$30,000
March 3, 1881	100,000
August 2, 1882	50,000
July 5, 1884	75,000
August 5, 1886	112,500
August 11, 1888	112,500
September 19, 1890	112,500
July 13, 1892	170,000
Total	762,500

The total expenditures to June 30, 1892, including all outstanding liabilities, were $761,914.92.

It is proposed to expend the funds available and any funds that may come available during the year in extending and raising the south d north jetties, the work to be done in accordance with the revised oject of March 11, 1891.

The appropriations heretofore made have been entirely inadequate to economical and advantageous prosecution of the work of improve- ent. The most satisfactory results can not be obtained with expendi- ures the next fiscal year of less than $1,000,000.

Money statement.

ly 1, 1892, balance unexpended	$2,123.09
mount appropriated by act approved July 13, 1892	170,000.00
	172,123.09
une 30, 1893, amount expended during fiscal year	171,367.22
uly 1, 1893, balance unexpended	755.27
uly 1, 1893, outstanding liabilities	170.19
uly 1, 1893, balance available	585.08
Amount (estimated) required for completion of existing project	1,817,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	1,000,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867, and of sundry civil act of March 3, 1893.

bstract of proposals for constructing jetty at entrance to Cumberland Sound, Georgia, opened on September 10, 1892, by Capt. O. M. Carter, Corps of Engineers.

o.	Name and address of bidder.	Mattresses per square yard.	Riprap stone per cubic yard.	Total.
1	Charles C. Ely, Savannah, Ga	$1.32	$3.78	$211,440.00
2	William H. Walsh, Fernandina, Fla	1.26	3.72	204,960.00
3	Edward H. Gaynor, Boston, Mass.*	1.05	3.59	181,520.00

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* Bid recommended for acceptance, he being the lowest responsible bidder for the best and most itable materials and service.

Amount available, $170,000.

COMMERCIAL STATISTICS.

Arrivals and clearances of vessels, and commerce, at Fernandina, Fla., from Janu 1875, to December 31, 1892.

ARRIVED.

Year.	Coastwise.			Foreign ports.						Total.	
				American vessels.			Foreign vessels.				
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.
1875...	212	117,363	4,192	47	10,379	359	12	7,437	135	271	135,179
1876...	210	141,354	4,749	25	4,893	179	28	9,232	249	263	155,479
1877...	150	100,581	3,343	31	3,768	217	40	12,547	404	221	121,896
1878...	183	120,845	3,900	17	3,985	101	22	8,294	215	222	133,124
1879...	205	133,020	4,133	28	10,634	252	10	5,639	126	243	149,293
1880...	270	146,722	4,470	34	22,396	598	22	9,463	240	326	180,581
1881...	273	171,548	4,186	17	11,899	314	24	11,563	271	278	195,040
1882...	239	146,383	3,279	16	9,056	242	15	6,639	151	270	162,078
1883...	183	96,937	2,453	6	1,769	43	14	5,229	137	203	103,935
1884...	176	105,061	2,864	3	865	21	10	4,029	88	189	109,755
1885...	169	111,698	3,131	7	999	47	22	9,785	210	198	122,482
1886...	205	147,418	4,014	7	2,112	53	15	5,187	146	227	154,717
1887...	349	317,798	5,030	19	6,402	122	22	8,565	220	390	332,965
1888...	274	179,130	4,456	19	7,152	156	18	6,789	177	311	193,071
1889...	262	164,229	3,908	48	16,434	369	39	12,936	363	349	193,594
1890...	267	172,202	3,948	40	14,683	305	33	11,518	306	340	198,403
1891...	226	164,588	3,530	18	6,175	140	34	17,654	433	278	188,417
1892...	247	189,855	3,760	26	10,027	195	54	39,487	805	327	239,361

CLEARED.

1875...	229	121,028	4,303	31	8,239	228	15	5,343	212	275	134,610
1876...	244	161,154	5,058	21	6,040	147	26	9,002	269	291	166,196
1877...	165	106,615	3,590	24	6,340	166	42	13,741	412	231	126,596
1878...	195	124,883	4,086	19	4,911	123	26	9,080	236	240	138,874
1879...	175	129,654	4,079	31	11,067	258	12	8,016	164	218	148,737
1880...	244	155,659	4,505	31	14,207	327	24	10,202	240	299	180,068
1881...	204	138,593	3,730	41	22,007	506	31	15,335	351	276	175,940
1882...	217	136,666	3,166	39	15,497	370	31	14,962	321	287	167,125
1883...	153	85,815	2,245	32	8,925	210	24	9,413	231	209	94,153
1884...	178	104,462	2,688	27	8,831	176	15	6,488	158	210	119,781
1885...	185	112,936	2,970	33	10,251	249	21	9,393	221	239	132,580
1886...	214	153,092	4,208	27	9,072	200	26	9,817	299	267	171,981
1887...	306	326,342	4,500	29	8,552	232	33	11,607	327	368	346,501
1888...	280	175,490	4,586	28	9,190	184	20	8,622	204	328	193,302
1889...	298	181,075	4,240	46	13,652	342	45	16,286	428	389	211,013
1890...	276	176,330	4,074	41	14,394	317	34	13,149	319	351	203,873
1891...	228	156,272	3,507	18	6,407	136	49	31,117	702	295	193,796
1892...	244	183,840	3,668	23	8,784	174	77	58,428	1,116	344	329,352

COMMERCE.

Year.	Value of exports.		Value of imports.		Total commerce.
	Foreign.	Coastwise.	Foreign.	Coastwise.	
1875	$209,791	$1,119,979	$14,304	$755,718	$2,089,792
1876	226,076	1,170,240	46,179	1,131,032	2,573,827
1877	310,225	676,855	19,304	1,146,363	2,152,747
1878	248,000	780,607	8,142	172,234	1,901,983
1879	275,470	921,368	11,038	1,360,432	2,568,308
1880	257,780	667,092	3,676	1,365,857	2,294,405
1881	242,100	1,064,394	11,791	1,786,546	3,104,831
1882	292,400	1,342,421	45,792	7,536,588	3,217,201
1883	248,600	2,573,010	11,229	2,262,755	5,095,594
1884	173,600	1,164,462	1,874	1,738,620	3,078,556
1885	214,726	2,134,541	4,180	1,502,544	3,855,991
1886	191,595	2,843,000	590	1,625,000	4,660,185
1887	226,960	3,500,000	23,896	2,000,000	5,750,856
1888	175,150	2,500,000	....	650,000	3,325,150
1889	325,980	3,970,180	601	3,150,000	7,446,761
1890	478,475	2,245,753	10,902	4,997,683	7,732,813
1891	778,251	1,708,276	....	2,938,000	6,424,527
1892	1,389,043	1,125,543	701	6,500,000	9,015,287

JAMES A. PINE,
Collec

Capt. O. M. CARTER,
Corps of Engineers, U. S. A.

rrivals and clearances of vessels, and commerce, at St. Marys, Ga., from January 1, 1879, to December 31, 1892.

ARRIVED.

Year.	Coastwise.			Foreign ports.						Total.		
				American vessels.			Foreign vessels.					
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.
79......	53	16,773	378	6	2,303	54	14	5,155	148	78	24,231	475
80......	30	8,982	204	2	694	17	16	6,409	185	48	16,085	404
81......	22	7,541	156	6	2,491	54	25	11,282	290	53	21,324	500
82......	28	10,504	196	1	371	7	15	5,723	146	44	16,508	347
83......	26	9,596	132	3	1,207	24	6	2,112	44	35	12,912	250
84......	32	11,294	224	1	530	9	6	2,334	57	39	14,065	290
85......	40	13,042	280	1	396	8	5	2,028	52	46	15,406	340
86......	20	7,882	140	1	321	7	6	2,086	56	27	10,288	203
87......	37	13,247	222	1	405	9	8	4,286	90	46	17,938	321
88......	55	20,897	440	1	433	8	3	1,365	32	36	22,695	489
89......	60	24,000	540	9	3,575	70	14	5,571	133	83	33,146	743
90......	39	16,328	300	6	2,058	45	7	2,856	68	52	21,242	413
91......	44	18,578	322	1	330	8	2	747	20	47	19,655	350
92......	68	29,417	540	9	3,283	68	6	3,177	64	83	35,877	672

CLEARED.

Year.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.
79......	53	16,773	378	10	3,577	83	14	5,155	143	77	25,505	604
80......	30	8,982	202	3	1,150	27	12	4,979	132	45	15,111	361
81......	22	7,541	156	7	3,362	68	29	12,463	323	58	23,336	547
82......	28	10,504	196	4	1,567	82	18	6,791	175	50	18,862	403
83......	26	9,596	182	3	1,207	24	6	2,112	46	35	12,915	252
84......	32	11,294	224	2	1,097	19	6	2,234	57	40	14,625	300
85......	40	13,042	280	3	1,195	25	4	1,595	42	47	15,732	347
86......	20	7,882	140	5	2,312	40	5	1,646	45	30	11,840	210
87......	......	....	....	1	425	9	8	4,286	90	8	4,286	90
88......	56	21,330	448	5	2,086	41	5	1,587	46	66	25,273	535
89......	60	24,000	540	9	3,575	70	14	5,571	133	83	33,146	743
90......	......	....	....	3	877	21	7	1,856	68	10	3,733	89
91......	1	1	1	5	2,265	38	2	818	18	7	3,083	56
92......	68	29,417	540	7	3,089	57	6	3,177	64	81	35,683	661

COMERCE.

Year.	Value of exports.	Year.	Value of exports.
879	$82,491	1886	$36,520
880	70,411	1887	428,500
881	149,333	1888	212,045
882	47,216	1889	343,496
883	26,902	1890	37,867
884	22,517	1891	32,300
885	27,127	1892	353,629

Wm. A. White,
Collector.

Capt. O. M. Carter,
Corps of Engineers, U. S. A.

REPORTS ON CONDITION OF CHANNEL BETWEEN CUMBERLAND ISLAND, GEORGIA, AND FERNANDINA, FLA., CALLED FOR BY SENATE RESOLUTION OF DECEMBER 12, 1892.

[Printed in Senate Ex. Doc. No. 19, Fifty-second Congress, second session.]

War Department,
Washington, January 3, 1893.

Sir: By resolution of the Senate, dated December 12, 1892, the Secretary of War is "directed to furnish to the Senate any information in possession of the Chief of Engineers as to the condition of the present ship channel between Cumberland Island, Georgia, and Fern dina, Fla., and the injury to it from the construction of the north je and its present unfinished condition, and as to the danger of the clo of the channel on account of the obstruction created by this work a the necessity for an immediate appropriation to prevent the closin the channel."

In response to that resolution I have the honor to transmit here a letter from the Chief of Engineers, dated December 27, 1892, sub ting a copy of a report, dated December 22, 1892, with two maps,* the subject, from Capt. O. M. Carter, Corps of Engineers, the office charge of the improvement, which report the Chief of Engineers rem contains the latest information in his office respecting the locality m tioned.

Very respectfully,

S. B. ELKINS,
Secretary of War

The PRESIDENT OF THE UNITED STATES SENATE.

LETTER OF THE CHIEF OF ENGINEERS.

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 27, 189

SIR: I have the honor to acknowledge the reference to this offic report of resolution dated December 12, 1892, of the Senate of the Uni States, by which the Secretary of War is "directed to furnish to Senate any information in possession of the Chief of Engineers a the condition of the present ship channel between Cumberland Isla Georgia, and Fernandina, Fla., and the injury to it from the constr tion of the north jetty and its present unfinished condition, and a the danger of the closing of the channel on account of the obstruct created by this work and the necessity for an immediate appropria to prevent the closing of the channel."

In returning the resolution of the Senate, I have to submit the companying copy of report, with two maps, of the 22d instant, on subject, by Capt. O. M. Carter, Corps of Engineers, the officer in cha of the improvement, which contains the latest information in this of respecting the locality mentioned.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

Hon. S. B. ELKINS,
Secretary of War.

REPORT OF CAPT. O. M. CARTER, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Savannah, Ga., December 22, 189

GENERAL: I have the honor to submit herewith a report on the co dition of the ship channel between Cumberland Island, Georgia, a Fernandina, Fla., as required by Senate resolution of December 1

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*Omitted in printing.

1892, and instructions from the Chief of Engineers of December 13, 1892.

There are submitted with this report a map of the entrance to Cumberland Sound, Georgia and Florida, showing characteristic soundings and curves of equal depth on the bar and adjacent shoals, as developed by an examination made during the month of November last, and a sheet of comparative charts reduced from the survey of 1889, and from examinations made in November, 1891, May, 1892, and November, 1892. The former shows the conditions now existing; the latter shows the changes that have taken place since the year 1890, through which the present conditions have been reached.

On the chart for 1889 there is found a deep channel of ample width along the northern side of the south jetty. The 12-foot curve is fully 900 feet from the jetty at its nearest point. Farther out it recedes from the line of the jetty and is widely separated from the southern 12-foot curve, which reaches northward beyond the prolongation of the jetty axis. The inner 18-foot curve extends to within 800 feet of the end of the finished foundation course, with only a slight break in its continuity; and the 15-foot curve extends without a break beyond the end of the south jetty. Fifteen and 18 foot areas are again found farther seaward. The 18-foot area appeared south of the jetty only as a narrow strip close to the jetty and less that 100 feet in width.

A partial examination made in June, 1890 (not shown on this sheet), showed that the northern 12 foot curve had approached to within 400 or 500 feet of the south jetty, but the general line and depth of the channel were still maintained.

The examination of November, 1891 (Comparative Chart No. 2), shows that great and very undesirable changes have taken place. The north shoals have continued their southerly advance, and at the end of the south jetty the 12-foot curve is only 200 feet distant. The 15-foot curve has replaced the 18-foot curve of 1889, and the 18-foot area is greatly reduced. But the worst feature of these changes is found in the extension of the northern 12-foot shoal across the channel beyond the jetty and its union with the shoals south of the jetty, and also in the deepening that has taken place along the southern side of the jetty. The 18-foot area south of the jetty has attained a width of about 700 feet, and the 15-foot area has been pushed far beyond the end of the jetty. The channel still lies north of the jetty, but makes a sharp and difficult curve in crossing the 12-foot shoal.

The examination of May, 1892 (Chart No. 3), presents further unfavorable conditions. There have been no marked changes north of the outer end of the south jetty; but on the southern side of the jetty the scour has continued, breaking through the 12-foot shoal and pushing the inner 15-foot curve out to a point only 400 or 500 feet from the 15-foot curve on the outer slope of the bar. The channel line is now south of the outer end of the south jetty, and runs due east and west.

The examination made last month, November, 1892 (Chart No. 4), shows little or no change in the channel line since last May. The 12-foot curves both north and south of the south jetty remain practically the same. The 15-foot area south of the jetty has contracted to a slight degree. Additional shoaling has, however, occurred in the old channel north of the jetty. Fifteen-foot areas are found in November where 18-foot areas existed in May.

There is still a practicable channel along the northern side of the south jetty, but it turns to the south at the present end of the jetty, crossing the line of the proposed extension. If we imagine this jetty completed without any change in existing depths, there would be only 11.7 feet of water at the shoalest point of the resulting channel. In the channel now used the shoalest water is found just before reaching the outer slope of the bar. The minimum channel depth is 12.6 feet. The outer slope of the bar is very steep, the distance between the 15 and 24 foot curves being only from 200 to 300 feet.

There remain to be noted the increase and the seaward movement of those areas of the north shoals that rise above the level of mean low water and the seaward advance of the outward slope of the bar. The outer 15-foot curve has been pushed out about 350 feet since the year 1889.

From the report of the Board of Engineers on the improvement of Cumberland Sound, Georgia and Florida, dated New York City, March 11, 1891, there may be quoted as bearing on this subject the following words:

> The present condition of this improvement can not be regarded as satisfactory, especially in view of the fact that the funds now available, or likely soon to become available, are insufficient to execute the work required by the existing conditions to be done with great promptitude. This is apparent from the following statement: The north jetty in no degree checks the natural encroachment of the sand advancing from north to south upon the channel across the bar. This movement, as shown above, has continued since 1879 and, although perhaps checked a little by the incomplete south jetty, now threatens to shoal up the narrow passage still remaining north of it and thus to compel the whole flow to cross the jetty. The survey of July, 1890, showed that the width between the jetty and the northerly 12-foot curve had been reduced from 900 feet in 1889 to about 400 feet.
>
> The proposed locus of the deep-water entrance is thus choked up by an immense mass of sand, which already throws a strong current over the outer extremity of the south jetty, or rather over the single foundation course which represents a jetty in this vicinity. Moreover, an extensive southerly pocket exists in the southerly 12-foot contour, which crosses the line of the jetty still further shoreward, and this may assist the navigable bar channel to desert the desired route entirely.

And further from the same report:

> The general order of work under future appropriations should be the following, considerable discretion being left to the engineer in charge, to meet new conditions as they arise: The construction of the north jetty should be first undertaken, and it should be raised to a height sufficient to effectually stop the sand movement southward; then the south jetty should be raised and extended as may be found necessary to obtain the desired depth over the bar.

The dangers foreseen and pointed out in the words above quoted are now realized. The 12-foot curve has continued to encroach on the deep but narrow channel that follows the northern side of the south jetty, and has thrown to the eastward beyond the present end of the south jetty a spur that touches the proposed location of the end of this jetty and extends about 1,000 feet beyond that point. In November of last year this 12-foot curve was continuous across the bar and joined that from the south. Shortly afterward this curve was broken through south of the prolongation of the south jetty, thus causing "the navigable bar channel to desert the desired route entirely." The present channel crosses the line of the south jetty about 2,400 feet inside of the seaward end of the finished foundation course and passes 600 or 700 feet south of the end of the proposed jetty. Furthermore, the stability of the existing portion of the south jetty is threatened by the strong tidal currents thrown across it by the advancing shoals. An undermining action can not fail to attend the overflow of these cross currents and unless the filling up of the outlet between the jetties be checked the destruction of a portion of the south jetty is to be apprehended.

All of the funds that have become available since the year 1890 have been applied to the work of extending the foundation course of the north jetty, and this has reached a point 14,930 feet from the initial point, measured along the axis of the jetty. This work is now progressing as rapidly as its difficult location and extreme exposure will permit. A single course of mattresses and stone will, however, only to a slight degree check the southerly drift of the sand; and the funds now available will not permit such an extension, even of the foundation course, as will carry it across the shoals of drifting sand.

The shoals that now block the entrance could scarcely be maintained in their original dimensions, much less could they be advanced, in the face of the strong ebb currents sweeping their steep southern slopes, were it not that a constant and vast supply of material is brought to them from the north, enough not only to load the currents to their full transporting capacity, but in addition to leave a surplus on the slope of the shoals and thus increase their extent. If this supply were cut off the currents would have an opportunity to perform their legitimate work of erosion, instead of being taxed to their utmost in transporting extraneous material. The southerly drift of the sand can only be checked by extending and raising the north jetty, and that this should be done with great promptitude is apparent from a study of the dangerous conditions that now exist and that threaten to increase in gravity.

The raising of the south jetty would no doubt force the maintenance of a deep but exceedingly narrow channel close along its northern face, but the excessive local scour generated would probably undermine the jetty and destroy the work if it should be attempted before the southerly advance of the shoals is checked, and the constant supply of sand drifting into the channel would be forced seaward and cause shoaling beyond the end of the jetty. Moreover, as the south jetty is located in deep water, the great cost and time requisite for raising it to an effective height would prevent the immediate remedy by this means of the existing unfavorable conditions.

The only effective remedy that can be applied is the extending and raising of the north jetty, thereby striking at the source of the difficulty and preventing the further encroachment of the shoals upon the narrow channel still remaining between them and the south jetty. The fact can not be disguised that should this movement be allowed to continue, there is a serious danger of the filling up of the channel to such an extent as to cause disastrous results to the shipping of the port of Fernandina, already embarrassed by the deterioration of the channel.

Fernandina is the deep-water port of the Atlantic coast of Florida. It is the principal shipping point for the Florida phosphate rocks* to foreign ports in deep-draft steamers, as well as for fruits and vegetables to northern ports. It is also the terminus of the Mallory line of steamships to New York and of the Florida Central and Peninsular Railroad, which reaches, with its connections, all parts of Florida.

Great and important interests are therefore involved in the maintenance of the bar channel, and it is imperative that the work on the north jetty should be pushed on until a height is reached sufficient to check the southerly drift of the sands and the consequent filling up of the channel. Should the work be stopped when the limited funds now available are exhausted, the advance of the shoals will continue, possibly to the extent of blocking this entrance entirely to deep-draft vessels.

A sum of at least $250,000 is imperatively necessary for such an extension and raising of the north jetty as will prevent the further shoaling of the channel, and an immediate appropriation of at least that amount is urgently requested.

Very respectfully, your obedient servant,

O. M. CARTER,
Captain, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

N 12.

IMPROVEMENT OF INSIDE WATER ROUTE BETWEEN SAVANNAH, GA., AND FERNANDINA, FLA.

The location of this route is shown by a dotted line on Coast Survey charts Nos. 156 and 157, and a detailed description of it is given in my report of a survey dated November 25, 1891, which is printed as part of Appendix N 12, Annual Report of the Chief of Engineers for 1892, pp. 1311 to 1326.

The distance from Savannah to Fernandina by the inside route just described is about 160 miles.

Touching at Darien en route increases the distance by about 20 miles, and at Brunswick by about 12 miles.

ORIGINAL CONDITION.

The route leaves the Savannah River by St. Augustine Creek and following Wilmington River reaches Romerly Marsh, through which two routes exist—the old one through Romerly Marsh Creek, very crooked and narrow and almost impracticable at low water, and the new route through Dead Mans Hammock Creek and the dredged cut connecting the same with Wassaw Creek, through the latter and Odingsell River to Adams Creek, where it joins the first route. From Romerly Marsh the route traverses the following streams or portions of them, viz, Adams Creek, Vernon River, Ogeechee River, Florida Passage, and Bear River; then crosses St. Catherines Sound and follows North Newport River (or Walburg Creek), Johnsons Creek, and South Newport River into Sapelo Sound. In all parts of the route just described, south of Romerly Marsh, the depths exceed 7 feet at mean low water, ranging generally from 10 to 20 feet and often exceeding the latter depth.

On leaving Sapelo Sound the most serious obstruction of the entire route is found in the long stretch of shallow water in Mud River. For a distance of more than 3.5 miles the depth is less than 7 feet, the mean depth is 5.8 feet, and the least depth 4.8 feet, all referred to mean low water. From Mud River the channel follows New Teakettle Creek, crosses Doboy Sound, and enters North River, thence through a portion of Rockdedundy River, reaches Little Mud River, in which there is a shoal of small extent carrying slightly less than 7 feet at mean low water. Crossing Altamaha Sound the channel continues through Buttermilk Sound and Frederica Creek into St. Simon Sound. About mile north of Frederica Landing the channel is narrow and is partially obstructed by oyster beds.

Entering Jekyl Creek from St. Simon Sound two shoals are encou ered, one just outside the entrance and the other inside, at the point where the creek widens. The least mean low-water depths on those shoals are 4.8 feet on the former and 5.3 feet on the latter. The route crosses St. Andrew Sound by a detour seaward around the middle ground, and thence by way of Cumberland River and Cumberland Sound reaches Fernandina, Fla.

From Jekyl Creek southward the depths are ample, exceeding in most places 10 feet at mean low water, and navigation is easy, except at one point known as "The Dividings," at the mouth of Crooked River. At that point a sharp turn of more than 100 degrees is made by the channel in passing Horseshoe Shoal. The least channel depth is, however, fully 7 feet at mean low water, and greater depths are found on either side of the shoal. Were the channel properly marked by ranges and buoys no difficulty in navigating it should be experienced.

PLAN OF IMPROVEMENT.

The existing project of improvement, adopted in 1892, provides for the establishment of a channel of 7 feet deep at mean low water between Savannah, Ga., and Fernandina, Fla. This is to be accomplished by the improvement of Romerly Marsh, Mud River, Little Mud River, and Jekyl Creek, by means of dredging and the construction of closure dams and training walls of brush mattresses loaded with riprap stone. The estimated cost of the improvement is $105,000, provided that the entire sum is made at once available.

SUMMARY OF OPERATIONS PRIOR TO JULY 1, 1892.

No appropriation had ever been made for this work prior to the above date, but work has been done under the appropriations for the improvement of Jekyl Creek and its mouth. In this respect, I refer to the report upon Jekyl Creek.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1893.

The first sum ever appropriated for this work was one of $15,000 made July 13, 1892. Work during the fiscal year was entirely confined to Jekyl Creek under a contract awarded March 1 to the Atlantic Contracting Company. There were put into the training wall 17,170.97 square yards of brush mattresses and 1,252.51 cubic yards of riprap stone.

CONDITION OF WORK JUNE 30, 1893.

The training wall at the mouth of Jekyl Creek is in good condition and the channel over the bar alongside of it has a least mean low-water depth of 5½ feet.

COMMERCE AND NAVIGATION.

The inside route is of great value to the coasting trade between Savannah and Fernandina and the intermediate points. A regular line of steamers plies the entire route, making semi-weekly trips. Another line is established between Savannah and Darien, making three trips per week. A small steamer makes daily round trips between Brunswick and Darien, and on the Cumberland route a daily round-trip schedule is maintained between Brunswick and Fernandina, connecting at Brunswick with the Brunswick and Western and the E Tennessee, Virginia and Georgia railways. The above-named steam carry passengers as well as freight. There are also a number of sm freight steamers making irregular but frequent trips between the Og-chee, Altamaha, and Satilla rivers and the ports of Savannah, Dari and Brunswick. Other small steamers are engaged in the oyster a fishing business, and ply between the numerous oyster beds and fish ground along the inside route and the several coast cities. A lar fleet of sloops and schooners of from 25 to 50 tons burden bring oy-ters, fish, rice, and shells from points along the inside route to th cities, and a number of barges towed by tugboats are used in tran porting the products of the sea and of the coast plantations to the c markets. Large vessels are often towed from port to port with cargo or ballast by the inside route to another port to complete th cargoes, thus avoiding rough weather at sea. About 25,000,000 feet lumber are annually rafted and towed from the mouth of the Altama River to Sapelo Sound and St. Simon Sound for shipment in deep-dr vessels to foreign ports.

It is difficult to estimate the actual amount and value of the co merce dependent upon the inside route, owing to its varied charac and to the fact that much miscellaneous freight is carried by the pa age, its weight and value not being known. The steamers of the S Island and the Cumberland routes and the other regular lines draw n over 6 feet of water. The tugboats engaged in rafting lumber and towing vessels, barges, and lighters draw from 7 to 10.5 feet, and vess under tow often have the maximum draft that can be carried throu the portion of the route they traverse.

The freights carried outward from the cities along the inside rou are mainly general merchandise, commercial fertilizers and guano, m and camp supplies. The freight collected along the route and broug to the cities consists of cotton, rice, naval stores, vegetables, fruit, oy-ters, fish, and shells.

Commercial statistics were collected with reference to the points which work of improvement would be necessary, and an estimate, bas on the most reliable sources of information available, is given in th following table:

Through—	Number of trips.	Tons of freight.	Value of freight.	Numb of pa seng
Romerly Marsh	820	51,000	$1,020,000	10
Mud River	1,460	60,800	970,000	3.
Little Mud River	570	28,000	325,000	4
Jekyl Creek	2,520	45,000	955,000	26.
The Dividings	1,080	19,000	460,000	11.

The above table does not include the commerce of the boats of les than 20 tons burden or the tonnage of the towboats engaged in towin vessels and lighters. Some of the commerce included in the abov table passes two or more of the points under which it is grouped, and is therefore counted more than once. Considering the route as a whole the total traffic during the year ending June 30, 1891, was approxi-mately as follows:

Number of trips	4,9
Tons of freight carried	156,
Value of freight	2,787,
Number of passengers	41,0

The above statistics were collected during the year 1890–'91, and they have been adopted without change for the year 1891–'92, they being believed to be close approximations to the truth.

The improvement of the shoals which now obstruct navigation on the inside route would render possible a much better passenger and freight service than is now maintained. The boats of the regular lines would then be able to run on schedule time, and not be compelled to wait for a suitable stage of tide for crossing the shoals. The boats of the Cumberland route carry the United States mails as well as passengers and freight, and are so run as to connect with the Florida Central and Peninsular Railway at Fernandina and the Brunswick and Western and the East Tennessee, Virginia and Georgia. railways at Brunswick.

MISCELLANEOUS.

This work is located in the collection districts of Savannah, Brunswick, and St. Marys, Ga., and Fernandina, Fla. The amount of duties collected in 1892 was $47,687, $6,408.15, nothing, and $3,604.22, respectively. The nearest light-houses are those upon the Savannah River, near the beginning, and Amelia Light, at the end, of the route, with Sapelo, Wolf Island ranges, St. Simons, and Little Cumberland lights between. Forts Oglethorpe and Pulaska, Ga., and Clinch, Fla., are the nearest forts.

Since the existing project for improving this route was adopted one appropriation of $15,000 has been made, although three appropriations, aggregating $20,000, have been made for the improvement of Jekyl Creek, one part of this route needing improvement.

The total expenditures under the present project up to June 30, 1893, including all outstanding liabilities, were $14,937.69.

It is proposed to expend any funds which may become available during the year in executing works of improvement outlined in my report of November 25, 1891.

The sum of $90,000 can be advantageously and economically expended during the coming year. Unless the sum asked for is appropriated at once, the cost of the work will be greatly increased.

Money statement.

Amount appropriated by act approved July 13, 1892	$15,000.00
June 30, 1893, amount expended during fiscal year	346.69
July 1, 1893, balance unexpended	14,653.31
July 1, 1893, outstanding liabilities	14,591.00
July 1, 1893, balance available	62.31
Amount (estimated) required for completion of existing project	90,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	90,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for improving Jekyl Creek, Georgia, and inside water route between Savannah, Ga., and Fernandina, Fla., opened on February 7, 1893, by Capt. O. M. Carter, Corps of Engineers.

No.	Name and address of bidder.	Mattresses (9,000 square yards).		Riprap stone (3,000 cubic yards).		Total.
		Price.	*Amount.*	*Price.*	*Amount.*	
1	The Atlantic Contracting Co., New York, N. Y., John F. Gaynor, president *	$0.99	$8,910	$3.59	$10,770	$19,680
2	Colin McK. Grant, Charleston, S. C	1.25	11,250	3.70	11,100	22,350

* Bid recommended for acceptance, they being the lowest responsible bidders for the best and most suitable materials and services.

Amount available, $21,000.

N 13.

REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGER-ING NAVIGATION.

WRECK OF THE AUSTRIAN BARK UNDINE, SAVANNAH HARBOR.

On February 26, 1893, the Austrian bark *Undine*, from Port Said i ballast, having discharged at Quarantine according to regulations, w being towed up the river during a fresh northeasterly wind. When abo a mile above Upper Quarantine the bark took a heavy list to port an went over on her beam ends. Immediate efforts at righting her we made, but proved ineffectual, and the water soon getting over her hat coamings she filled and sank in the channel, about 600 feet below Wi Dams Nos. 28 and 35, in about 12 feet of water at mean low tide. Aft several fruitless attempts on the part of the owners to raise the vess the task was given up and the rigging and other detachable parts r moved. She was then sold at auction and was purchased by Mr. F. Jones, of Savannah, who made an attempt to raise her, but not su ceeding abandoned her. On April 26, sixty days after the sinkin authority to remove the hull was requested, the wreck proving a dange ous menace to shipping. This request was approved by the Secreta of War on May 6, and an allotment of $4,000 with which to do the wor was made. Proposals were opened on June 17, and the contract wa awarded to Messrs. Johnston & Townsend, Somers Point, N. J., th lowest bidders, who will begin the work of removal early in the nex fiscal year.

The dimensions of the vessel are: length, 183.7 feet; breadth, 35. feet; depth, 19.6 feet. She is a composite vessel and was built in England in 1867. When sunk she was empty.

Abstract of proposals for removing wreck of the bark Undine, now lying in Savannah Harbor, Georgia, opened on June 17, 1893, by Capt. O. M. Carter, Corps of Engineers.

No.	Name and address of bidder.	Amount.	Remarks.
1	Merritt Wrecking Organization, Norfolk, Va	$12,000	Will pay for hull intact, $2,000.
2	Chapman Wrecking and Derrick Co., New York, N. Y	4,788	
3	B. Gordon Baillie, Philadelphia, Pa	3,900	
4	Colin McK. Grant, Charleston, S. C	5,700	
5	Jacobson & Morris, Savannah, Ga	4,800	
6	Johnston & Townsend,* Somers Point, N. J	3,645	

* Bid recommended for acceptance, they being the lowest responsible bidders for the best and most suitable materials and services.

Amount available, $4,000.

N 14.

PRELIMINARY EXAMINATION OF SAVANNAH RIVER, GEORGIA, BETWEEN SPIRIT ISLAND AND THE POINT WHERE THE CHARLESTON AND SAVANNAH RAILWAY CROSSES SAID RIVER.

[Printed in House Ex. Doc. No. 50, Fifty-second Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 5, 1892.

SIR: I have the honor to submit the accompanying copy of report, dated November 14, 1892, by Capt. O. M. Carter, Corps of Engineers, upon preliminary examination of "Savannah River, Georgia, between Spirit Island and the point where the Charleston and Savannah Railway crosses said river," made to comply with provisions of the river and harbor act approved July 13, 1892.

This section of the Savannah River is at present under improvement by the United States. Work on that portion of the river from Spirit Island to within 5 miles of the Charleston and Savannah Railway bridge is carried on under a project which aims at securing a depth of 26 feet at mean high water from the city of Savannah to the sea, while the project under which work is being carried on for the improvement of the remaining 5 miles to the said railway bridge aims at securing a navigable steamboat channel 5 feet deep at ordinary summer low water between the cities of Augusta and Savannah. Detailed surveys of the Savannah River were made in 1889 and 1890, and reports thereon printed in the Annual Report of the Chief of Engineers for 1890.

Captain Carter reports that an examination made during November, 1892, shows that no material changes in the volume of commerce or in the physical condition of the river have taken place since the publication of the reports alluded to. In his opinion, Savannah River from Spirit Island to the Charleston and Savannah Railway bridge is worthy of improvement to the extent which has already been recommended and approved, and that no further survey is now considered necessary.

Col. Wm. P. Craighill, Corps of Engineers, the division engineer, is of the same opinion as the local engineer, and I concur in the views of these officers.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

Hon. S. B. ELKINS,
Secretary of War.

REPORT OF CAPT. O. M. CARTER, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Savannah, Ga., November 14, 1892.

GENERAL: In compliance with Department letter dated July 14, 1892, I have the honor to submit the following report of a preliminary examination of the "Savannah River, Georgia, between Spirit Island and the point where the Charleston and Savannah Railway crosses said river."

Spirit Island is 6 miles below the city of Savannah and the Charleston and Savannah Railway bridge is 14 miles above. Operations for the improvement of the 6 miles below the city of Savannah and the fir 9 miles above are now being carried on under a project which aims a securing a depth of 26 feet at mean high water from the city of Savann to the sea, while the project under which work is now being carried o for the improvement of the remaining 5 miles to the Charleston an Savannah Railway bridge aims at securing a navigable steamboat cha nel 5 feet deep at ordinary summer low water between the cities o Augusta and Savannah.

Detailed surveys of the Savannah River, covering the portion und consideration, were made under my direction in 1889 and 1890, an reports thereon were submitted by me on June 30, 1890. Those report together with statements of the amount of commerce and navigati interested in the improvements, are published on pages 1259 and 13 of the Annual Report of the Chief of Engineers for 1890.

An examination made during the present month shows that n material changes in the volume of commerce or in the physical co dition of the river have taken place since the publication of the repor alluded to, and, inasmuch as the present and prospective demands o commerce, as well as the physical condition of the river, are fully s forth in those reports, I respectfully refer to them for details.

From all of the foregoing I am of the opinion that the "Savann River, Georgia, between Spirit Island and the point where the Charle ton and Savannah Railway crosses said river," is worthy of improv ment to the extent which has already been recommended and approve but as the necessary surveys have already been made and work und the approved projects has been begun, no further survey is now co sidered necessary, and no estimate of cost is therefore submitted.

Very respectfully, your obedient servant,

O. M. CARTER,
Captain, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. Wm. P. Craighill, Corps of Engineers, Divisio Engineer, Southeast Division.)

[First indorsement.]

UNITED STATES ENGINEER OFFICE,
Baltimore, Md., November 16, 1892.

Respectfully submitted to the Chief of Engineers.

I concur in the opinions and recommendations of the local enginee

WM. P. CRAIGHILL,
Colonel, Corps of Engineers.

N 15.

ESTABLISHMENT OF HARBOR LINES IN SAVANNAH RIVER IN VICINIT OF THE QUARANTINE STATION NEAR FORT PULASKI, SAVANNAH, GA.

UNITED STATES ENGINEER OFFICE,
Savannah, Ga., November 10, 1892.

GENERAL: The mayor of the city of Savannah has requested the establishment of the harbor lines in the vicinity of the quarantine station near Fort Pulaski. It is desired by the city to expend a considerable sum of money in the establishment of a modern quarantine station, and this can not be done until it is known how far their structures may extend without encroaching upon the harbor lines, which at that point have not yet been established.

I have the honor to recommend that the request of the may or be complied with and that the harbor lines in that vicinity may be established.

Very respectfully, your obedient servant,

O. M. CARTER,
Captain, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

[First indorsement.]

OFFICE CHIEF OF ENGINEERS,
U. S. ARMY,
November 14, 1892.

Respectfully returned to Captain Carter, who is requested to submit a drawing showing the harbor lines which, in his opinion, should be established in the vicinity of the quarantine station near Fort Pulaski.

By command of Brig. Gen. Casey.

H. M. ADAMS,
Major, Corps of Engineers.

[Second indorsement.]

U. S. ENGINEER OFFICE,
Savannah, Ga., January 10, 1893.

Respectfully returned to the Chief of Engineers, U. S. Army, Washington, D. C.

The proposed harbor line in the vicinity of the quarantine station near Fort Pulaski is shown on the accompany drawing* by the heavy red line. It is probable, however, that in the further improvement of the harbor it may be necessary to make a cut between Cockspur Island and Long Island, for the purpose of throwing a greater volume of water across Tybee Knoll on the ebb tide, in which case a location shown by the broken red line would be more desirable. For that reason I am of the opinion that for the present there should be adopted provisionally a harbor line as indicated by the broken red line previously mentioned, and that no structures should be allowed to project beyond that line.

O. M. CARTER,
Captain, Corps of Engineers.

[Third indorsement.]

OFFICE CHIEF OF ENGINEERS,
U. S. ARMY,
January 13, 1893.

Respectfully submitted to the Secretary of War.

In view of certain contemplated improvements the mayor of the city of Savannah, Ga., has requested the establishment of harbor lines in the Savannah River in the vicinity of the quarantine station near Fort Pulaski.

Captain Carter submits the accompanying map on which the proposed harbor line is shown by a heavy red line; but for the reasons given in the second indorsement hereon, he is of the opinion that for the present there should be adopted provisionally a line as indicated by the broken red line.

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*Not printed.

It is recommended that the line selected, as indicated by the broken red line, be approved for the present, and that the Secretary place his approval both upon this paper and the tracing submitted.

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

WAR DEPARTMENT,
Washington, D. C., January 19, 1893.

Approved as recommended by the Chief of Engineers.

S. B. ELKINS,
Secretary of War.

APPENDIX O.

IMPROVEMENT OF RIVERS AND HARBORS IN FLORIDA.

REPORT FOR THE FISCAL YEAR ENDING JUNE 30, 1893, WITH OTHER DOCUMENTS RELATING TO THE WORKS. OFFICERS IN CHARGE, MAJ. J. C. MALLERY AND LIEUT. A. M. D'ARMIT, CORPS OF ENGINEERS.

IMPROVEMENTS.

1. St. Johns River, Florida.
2. Upper St. Johns River, Florida.
3. Volusia Bar, Florida.
4. Ocklawaha River, Florida.
5. St. Augustine Harbor, Florida.
6. Indian River, Florida.
7. Northwest entrance, Key West Harbor, Florida.
8. Caloosahatchee River, Florida.
9. Channel of Charlotte Harbor and Pease Creek, Florida.
10. Sarasota Bay, Florida.
11. Manatee River, Florida.
12. Tampa Bay, Florida.
13. Withlacoochee River, Florida.
14. Harbor at Cedar Keys, Florida.
15. Suwanee River, Florida.

EXAMINATION.

16. Harbor at Cape Canaveral, Florida.

UNITED STATES ENGINEER OFFICE,
St. Augustine, Fla., July 10, 1893.

GENERAL: Being temporarily in charge, I have the honor to transmit herewith annual reports in duplicate upon the works of river and harbor improvement in the Florida district, in charge of Maj. J. C. Mallery, Corps of Engineers, for the fiscal year ending June 30, 1893.

Very respectfully, your obedient servant,

A. M. D'ARMIT,
Second Lieut., Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

O 1.

IMPROVEMENT OF ST. JOHNS RIVER, FLORIDA.

The portion of the river under improvement from Jacksonville to the ocean may be divided into four reaches, as follows:

1. Jacksonville to Dames Point: Length, 12.4 miles; average channel width between 20-foot contours, 1,100 feet; between 15-foot con-

tours, 1,300 feet; minimum 15-foot channel width, 550 feet; minimum mid-channel depth, 20 feet; mean range of tide, 1.4 feet.

2. Dames Point to Beacon No. 1 (1 mile below St. Johns Bluff): Length, 7.5 miles; aggregate length of channels less than 15 feet deep, 1.3 miles; average width of these channels between 9-foot contours, 400 feet; minimum mid-channel depth of defective portions, 12.5 feet; minimum mid-channel depth of remainder of reach, 15 feet; range of tide, 2.72 feet.

3. Beacon No. 1 to mouth: Length, 5 miles; average width between 9-foot contours, 700 feet; between 15-foot contours, 870 feet; minimum mid-channel depth (except at one place 1 mile long), 20 feet; depth at excepted place, 15 feet; range of tide, 4.34 feet.

4. Mouth to outer bar: Distance, 2.5 miles. Before the improvement was begun this was crossed by shifting channels from 2.1 to 2.5 miles long and having a mean low-water depth of from 5 to 7 feet. The tidal range on the outer bar is 5.8 feet. The present available depth in the channel across the bar is 10.7 feet at mean low water.

PROJECT OF IMPROVEMENT.

The operations for improving this channel have been carried on in accordance with a project submitted to the Chief of Engineers June 30, 1879, by the late Gen. Q. A. Gillmore, colonel, Corps of Engineers, and printed as part of Appendix I 7, Annual Report of the Chief of Engineers for 1879.

The approved project is to obtain a least mid-channel depth of 15 feet at mean low water from Jacksonville to the ocean. This depth is to be obtained across the bar at the mouth by concentrating and directing the flow of the river by two long jetties, starting from opposite shores of the entrance and converging until, near their outer extremities on the bar, they shall be 1,600 feet apart. The jetties are to be built of riprap stone on mattresses of log or brush and suitably capped. According to a detailed project approved June 11, 1891, and approved in a modified form March 30, 1892, the ship channel in the defective reach (Dames Point to Beacon No. 1) is to be deepened by dredging and protected by dikes and shore revetment of cheap construction. This work is now being carried out by means of an appropriation of $300,000 made for the purpose by Duval County. The estimated cost of this portion of the work is $324,000, and of the entire improvement $1,741,000. Gen. Gillmore's original estimate was $1,426,000. The increase in cost is due mainly to the increase in the depth of water in which the jetties must be built, caused by the scour around the ends during the long period of time in which the work has been carried on, and to other effects of the intermittent prosecution of the work, and, finally, to the increased depth as proposed by the modified project for Dames Point.

The following appropriations have been made for this work:

By act approved—	
June 14, 1880	$125,000
March 3, 1881	100,000
By act passed August 2, 1882	150,000
By act approved—	
July 5, 1884	150,000
August 5, 1886	150,000
By act passed August 11, 1888	175,000
By act approved—	
September 19, 1890	170,000
July 13, 1892	112,500
March 3, 1893	284,500
Total	1,417,000

The act of July 13, 1892, authorized a contract for the completion of the work at the mouth of the river, the amount of the contract not to exceed $397,000.

OPERATIONS PRIOR TO JUNE 30, 1892.

The work was done almost entirely by contract as funds were available. On June 30, 1892, the progress of the jetty construction was as follows:

South jetty.—The total length of this jetty, including shore extension, was 8,293 feet, of which 1,740 feet from Station-480 to Station 1260 was built up to the full height; thence to Station 3200, a length of 1,940 feet, the crest of the jetty was above mean low water; thence to Station 6860, a length of 3,660 feet, it was about at low water, in some places somewhat below it; thence to the end, a distance of 953 feet, the depths over the jetty varied from 13 to 18 feet at mean low water.

North jetty.—The total length of this jetty, including the shore extension, was 10,991 feet. From Station-57 to Station 496, a length of 553 feet, the jetty was built up to full height and capped, this portion being entirely covered by sand excepting the outside end of about 65 feet; thence to Station 6506, a length of 6,010 feet, the crest was at and above mean low water, excepting some gaps where the depth varied from 1 to 2 feet; thence to Station 6782, a length of 276 feet, the concrete coping of the jetty was 4 feet above mean low water; thence to Station 7250, a length of 468 feet, the crest was slightly above mean low water; thence to Station 8300, a length of 1,050 feet, it averaged about 1 foot below mean low water, and thence to the end, a length of 2,634 feet, it sloped down to a depth of about 10 feet.

OPERATIONS DURING FISCAL YEAR ENDING JUNE 30, 1893.

Work under the contract with Mr. Marcus Conant was completed December 30, 1892.

Under the provisions of the act of July 13, 1892, a contract was entered into November 30, 1892, and approved February 2, 1893, for the completion of the improvement at the mouth, with I. H. Hathaway & Co. Forty thousand dollars were reserved for superintendence, office expenses, and contingencies. Work under this contract should have begun February 1, 1893, but owing to delay occasioned by a part of the contractor's plant being ice-bound and by generally prevailing stormy weather no work was done until April 1, 1893.

In the specifications forming a part of this contract provision is made for the use of three classes of stone. The first class being stone weighing not less than 165 pounds to the cubic foot and in blocks weighing from 1 to 6 tons; 50 per cent to weigh 4 tons or over. The second-class stone weighs not less than 150 pounds to the cubic foot and is in pieces weighing from 20 to 400 pounds. The third-class stone weighs not less than 120 pounds nor more than 150 pounds to the cubic foot and is in pieces weighing from 15 to 300 pounds.

The third-class stone on the mattress forms the foundation and also the hearting of the superstructure. The second-class stone forms a covering for the third-class stone and a bed for the first-class stone which forms the capping at the height of mean low water.

No work whatever was done on the north jetty during the year.

During the past fiscal year, under the contract with Marcus Conant, 19,894 square yards of mattresses, 3,000 cubic yards of second-class stone, and 1,704 cubic yards of third-class stone were placed in the south jetty. Up to June 30, 1893, under the contract with I. H. Hathaway & Co., 449 cubic yards of second-class stone were placed between Stations 6700 and 6815, bringing the jetty at that place up to 3 feet below mean low water; 749.2 cubic yards of third-class stone between Stations 6850 and 7000, bringing the jetty up to from 8 to 11 feet below mean low water; 5,482.4 cubic yards of third-class stone between Stations 7500 and 8440, bringing the jetty up to from 4.5 to 13.5 feet below mean low water. The foundation of the south jetty was extended to Station 9498, 3,000 square yards of mattress and 798 cubic yards of third-class stone being used for this purpose.

Other work during the year consisted of the tidal observations and gauging, partial surveys of the bar made from time to time, and the annual survey of the bar and its vicinity.

PRESENT CONDITION OF THE JETTIES.

South jetty.—The foundation course of this jetty has been extended to Station 9498, giving the jetty a total length of 9978 feet, and the superstructure has been raised between Stations 6700 and 7000 and between Stations 7500 and 8440. From the inner end of the jetty to Station 6700 the jetty is about as was reported last year, a very slight lowering of the crest outside of Station 3000 having been caused by the waves. From Station 6700 to Station 6815 the jetty is at the height of 3 feet below mean low water, and is prepared to receive the capping of first-class stone. From Station 6815 to Station 7000 the crest of the jetty is from 8 to 11 feet below mean low water. No work has been done on the superstructure between Stations 7000 and 7500, that portion being left for a sailing gap. The channel used by vessels crosses the jetty at that place. The foundation course in the sailing gap has from 14 to 17 feet of water over it at mean low water. From Station 7500 to the end the depth over the jetty varies from 4.5 to 13.5 feet at mean low water, the least depth being at Station 8150 and the greatest at Station 7600.

North jetty.—The condition of the north jetty is practically unchanged since reported last year, no work having been done on it and no appreciable settlement or other change having taken place.

CHANGES SHOWN BY SURVEY OF 1893.

The shore line on both sides of the north jetty has been built out slightly. A marked change is shown on the south side of the south jetty, where a large accumulation of sand has taken place. With the exception of a small shallow basin, which appears to be rapidly disappearing, the shore line along the south side of the jetty has advanced to Station 2850. Where the sailing line crossed the jetty in 1885 and where in 1887 there was nearly 50 feet of water, the sand is now bare at low water. This large volume of sand is most likely the accumulation of that which has been removed from between the jetties by their action.

The channel north of the middle ground between the jetties has moved slightly towards the south and is merging into a channel south of the middle ground. The 18-foot contour now crosses the middle ground, so that there now exists a continuous channel having a depth of not less than 18 feet at mean low water to within 2,300 feet of the 18-foot contour on the outer slope of the bar. This movement of the channel between the jetties has resulted in the augmentation of the south jetty channel at the cost of the north jetty channel, which has deteriorated to such an extent that the distance between the 12 foot contours inside and outside the bar is now 2,200 feet, while last year it was only 300 feet.

The extension of the south jetty has resulted in the formation of a deep and well defined channel near to and parallel with it on the north side. The 15-foot contour has advanced at this place 600 feet, the 12-foot contour 900 feet, and the 9-foot contour 1,300 feet, and this in the face of the fact that until May only the foundation course had been built beyond Station 7000, a distance 2,500 feet inside of the 12-foot contour. The foundation had over it an average depth of 14 feet of water, which would necessarily permit the flow of a large volume over it on both the ebb and flood tides; while it had an average thickness of less than 3 feet, so that the influence of the south jetty in forming and maintaining the channel is clearly manifested. It is hoped that the foundation course of the south jetty will be completed within one or two months and it is believed that only a short time will elapse before the channel between the jetties will be available. Meanwhile the channel at present used by vessels is likely to deteriorate, and one of the objects in extending the jetty with the foundation course alone, in preference to building the superstructure as it advances, is to prevent, as far as possible, further shoaling in the present channel until a new channel is available.

Attention is respectfully invited to the report of Mr. E. A. Gieseler, assistant engineer, upon the gauging the St. Johns River. This work was undertaken for the purpose of determining whether the tidal range has been diminished during the construction of the jetties.

The following are the principal data obtained, viz: the fresh-water discharge during different stages of the river and the discharge at the mouth under mean tidal conditions.

The work consisted principally of tidal observations at seven points within the limits of the flow of the tide, viz: Mayport, Fulton, Dames Point, Jacksonville, Green Cove Springs, Palatka, and Welaka, and of observations of the heights of the river surface at Volusia, a point above the tidal limit, and of gauging the river at this point at different stages thereof, and also of gauging the river at the mouth at Mayport. In addition Mr. John E. Harris, of St. Francis (140 miles above the mouth) made gauge observations without any cost to the Government. The thanks of the Department are due him, as his observations were of much value in giving the heights of the water in the upper river at various stages.

In Table 1 of Mr. Gieseler's report will be found the height of mean high and low water reduced to the zero of the Mayport gauge for the places named above and for a low, high, and mean reading of the upper river gauge (St. Francis).

The influence of the varying state of the upper river on the heights of high and low water was observed to extend as far as Dames Point, 11.5 miles from the mouth, and its effect made itself felt simultaneously at the various points, and it is probable that greater freshets than occurred during the time of the survey will affect the heights of tides as far as the mouth.

In Table 11 will be found the time of mean high and mean low water at the points referred to.

The marked characteristics of the St. Johns River are the rapid decline of the tidal range in the lower portion of the river and the stability of the duration of the ebb and flood flow.

In Table 7 is given the fresh-water flow at Mayport when there i
average low and average high stage of the river. The mean fresh-w
discharge at Mayport is given as 370,000,000 cubic feet during tw
hours and twenty-five minutes, and probably varies between 340,00
and 400,000,000 cubic feet with the amount of annual rainfall.

In Table 17 is given the mean tidal flow at Mayport for an av
fresh-water flow for the smallest flow during the observation an
largest flow. Comparing the results with those obtained in 187
conclusion is reached that there has been in the interval a decrea
the tidal flow of the St. Johns River of between 10 and 15 per cen
that no contraction of the entrance, beyond what is necessary to
tain the required channel across the bar, should be made.

The improvement is in the collection district of St. Johns. Jacksonville
nearest port of entry; nearest light-house is St. Johns River Light; nearest
Fort Clinch, Fernandina, Fla.

The following papers accompany this report, viz:

Report of Mr. E. A. Gieseler, assistant engineer.
Report of Mr. J. H. Bacon, engineer in charge of Dames Point improvem
Map of bar and vicinity.
Comparative maps 1879–1893.

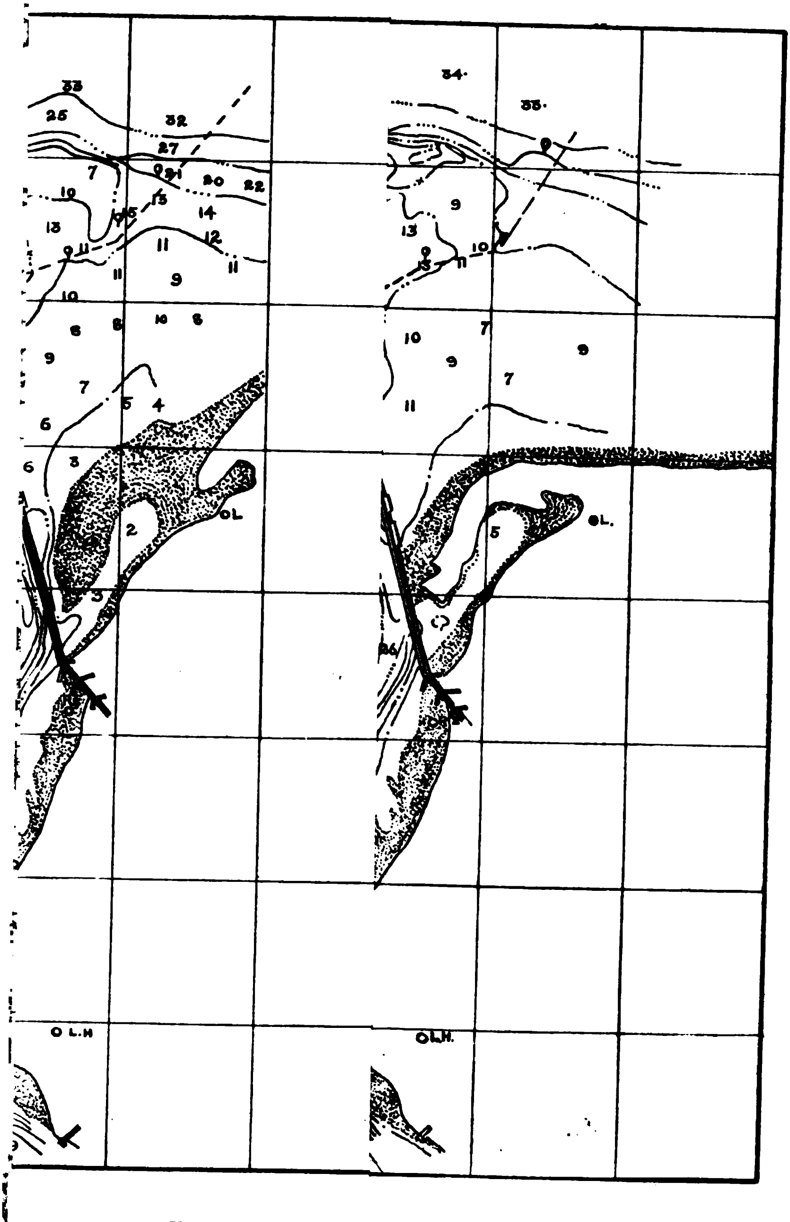
Money statement.

July 1, 1892, balance unexpended		$61,
Amount appropriated by act approved July 13, 1892		112,
Amount appropriated by sundry civil act approved March 3, 1893		284,
		453
June 30, 1893, amount expended during fiscal year		71
July 1, 1893, balance unexpended		386
July 1, 1893, outstanding liabilities	$7,900.88	
July 1, 1893, amount covered by uncompleted contracts	338,509.39	
		346
July 1, 1893, balance available		40

Abstract of proposals for furnishing labor and material for improving St. Joh
Florida, received in response to advertisement and opened October 15, 1892, by J.
lery, Major, Corps of Engineers.

No.	Name of bidder.	For mattresses in the work, per square yard.	For stone in the work, per ton of 2,000 pounds.
1	I. H. Hathaway & Co	$0.75 ($16,500)	First class, $4.30 Second class, $2.49 Third class, $2.69
2	R. G. Ross	.90 (19,800)	First class, $3.75 Second class, $2.79 Third class, $2.45
3	E. H. Gaynor	1.05 (23,100)	First class, $4.04 Second class, $2.60 Third class, $2.65
4	Marcus Conant	1.04 (22,880)	First class, $3.48 Second class, $2.48 Third class, $3.43

18-2
31-2



U.S. Engineer une 30th 1893.
'o accompany annual -reporps of Engineers U.S. Army.

Corps of Engieers U.S. Army.

As given in paragraph No. 38 of the specifications the estimated quantities of aterials required are as follows:

lattresses in the work	square yards..	22,000
tone in the work:		
First class	tons of 2,000 pounds..	20,000
Second class	do......	45,000
Third class	do......	90,000

As given in paragraph No. 47 of the specifications the contract is to be made on he basis of a total expenditure of $357,000. One hundred and five thousand dollars re now available for work.

Recommended that bid No. 1 be accepted.

EPORT OF MR. J. H. BACON, ASSISTANT ENGINEER, ON OPERATIONS DURING THE YEAR.

JACKSONVILLE, FLA., *July 3, 1893.*

SIR: I have the honor to submit the following report on the progress of the work improving the St. Johns River, Florida, in the vicinity of Dames Point, during the ar ending June 30, 1893.

In 1891 the county of Duval voted to issue bonds to the amount of $300,000 for the rpose of deepening the St. Johns River between Jacksonville and the mouth, and board of trustees to control this fund was appointed by the governor.

An estimate and project for the guidance of this board was prepared in your office. is project called for the construction of dikes (composed of a foundation mattress brush and a superstructure of stone with a hearting of shell) as follows, viz:

1. Dames Point training wall, 4,100 feet in length.
2. Island training wall, 2,400 feet in length.
3. Cut-off Dam, 3,150 feet in length.
4. Coon Point Dam, 2,700 feet in length.
5. Cedar Creek Jetty (abandoned), 800 feet in length.
6. St. Johns Bluff protection, 4,000, increased to 4,750, feet in length.

The project also called for the formation of five dredged cuts, as follows, viz:

. Dames Point Cut, 8,000 feet in length.
. St. Charles Creek Cut, 3,600 feet in length.
. Browns Creek Cut, 3,600 feet in length.
. Hannah Mill Creek Cut, 2,000 feet in length.
. Mile Point Cut, 2,500 feet in length.

he estimated amount of material to be removed from these cuts was 699,000 cubic ds, measured in scows.

unds for the work became available on May 1, 1892, and proposals for the work e opened on May 21, 1892.

Proposals received for dredging.

Name and address of bidder.	Price per cubic yard.	Amount.
	Cents.	
A. Bryan, River View, Fla	15	$105,000
Ross, Jacksonville, Fla	25	175,000
ama Dredging and Jetty Co., Mobile, Ala	21	147,000
national Contracting Co., New York City	21.9	153,300
. McDuff, Jacksonville, Fla	24½	171,500
rancisco Bridge Co., San Francisco, Cal	*20 †17	119,000
nford Ross, Jersey City, N. J	18.4	128,800
nnah Dredging Co., Savannah, Ga	19¾	138,250
Brainard, Jersey City, N. J	23¼	162,750

* In place. † In scows.

timated amount of dredging required, 700,000 cubic yards.

. Bryan's bid for dredging was accepted, but he was allowed to withdraw his n the dike work, which was then awarded to Mr. R. G. Ross, the next lowest r. With the consent of the trustees, Mr. Bryan entered into an arrangement the San Francisco Bridge Company to do the dredging at the rate of 18 cents ubic yard, measured in place.

Proposals for stone.

Name and address of bidder.	Price per cubic yard.	Amt.
James A. Bryan, River View, Fla	$2.25	[illegible]
R. G. Ross, Jacksonville, Fla	2.20	[illegible]
Alabama Dredging and Jetty Co., Mobile, Ala	2.50	[illegible]
International Contracting Co., New York City	2.55	[illegible]
W. A. McDuff, Jacksonville, Fla	3.52	[illegible]

Estimated amount of stone required, 30,000 cubic yards.

Proposals for shell.

Name and address of bidder.	Price per cubic yard.	[illegible]
James A. Bryan, River View, Fla	$0.99	[illegible]
R. G. Ross, Jacksonville, Fla	1.00	[illegible]
Alabama Dredging and Jetty Co., Mobile, Ala	1.10	[illegible]
International Contracting Co., New York City	1.25	[illegible]
W. A. McDuff, Jacksonville, Fla	0.90	[illegible]

Estimated amount of shell required, 12,000 cubic yards.

Proposals for mattresses.

Name and address of bidder.	Price per square yard.		[illegible]
	No. 1.	No. 2.	
	Cents.	*Cents.*	
James A. Bryan, River View, Fla	35	29	[illegible]
R. G. Ross, Jacksonville, Fla	50	58	[illegible]
Alabama Dredging and Jetty Co., Mobile, Ala	63	65	[illegible]
International Contracting Co., New York City	50	63½	[illegible]
W. A. McDuff, Jacksonville, Fla	70	71	[illegible]

Estimated amount of mattresses required, No. 1, 63,000 square yards; No. square yards.

Mr. Ross began the work on the dikes in July, 1892, and on January 31, completed the delivery of all material. On February 9, 1893, I accepted work on the dikes as having been satisfactorily performed, and forward secretary of the board of trustees the final estimate for this part of the work was as follows, viz:

53,394.8 square yards mattress, placed on dike, at 48 cents ....
17,690.2 square yards mattress, placed on dike, at 50 cents ....
34,519.9 cubic yards stone, placed on dike, at $2.20 ....
12,337.4 cubic yards shell, placed on dike, at $1 ....

Original estimated cost at contract prices ....

This material was distributed in the different dikes as follows:

Cedar Creek Jetty.

583 square yards mattress, at 50 cents ....
353.3 cubic yards stone, at $2.20 ....

This jetty was abandoned.

St. Johns Bluff shore protection.

196.1 square yards of mattress, at 48 cents	$14,014.12
46.4 cubic yards of stone, at $2.20	14,842.08
.7 cubic yards shell, at $1	999.70
	29,855.90
ginal estimated cost at contract prices	28,000.00

Coon Point Dam.

85.7 square yards mattress, at 50 cents	$2,992.85
66.2 square yards mattress, at 48 cents	1,903.78
59.3 cubic yards stone, at $2.20	15,530.46
.5 cubic yards shell, at $1	6,305.10
	26,732.19
ginal estimated contract price	29,398.00

Cut-off dam.

121.5 square yards mattress, at 50 cents	$5,560.75
7 9 cubic yards stone, at $2.20	17,353.38
.0 cubic yards shell, at $1	817.00
	23,731.13
ginal estimated cost at contract prices	17,208.50

Island training wall.

10.4 square yards mattress, at 48 cents	$4,003.39
0.7 cubic yards stone, at $2.20	11,177.54
.0 cubic yards shell, at $1	430.00
	15,610.93
ginal estimated cost at contract prices	12,471.00

Dames Point training wall.

92.1 square yards mattress, at 48 cents	$5,708.21
1.9 cubic yards stone, at $2.20	16,262.18
5.6 cubic yards shell, at $1	3,785.60
	25,755.99
ginal estimated cost at contract prices	20,667.00

he increase in cost over the original estimate is to be accounted for as follows,
:

. The shore protection at St. Johns Bluff was lengthened so as to protect the
ll bluff just below Fulton, which was being washed away.

. Work to the amount of $1,068.76 was done on the Cedar Creek jetty. This was
ndoned by the order of the Chief of Engineers, United States Army.

. On each of the remaining dikes the mattresses were built wider and the work
ried higher than had been estimated. This was especially the case with the
nes Point training wall. All of the dikes settled more than was expected, and
ome places the water had deepened since 1889; consequently more material was
uired.

s the work now stands all settlement has ceased and the dikes are perfectly
d and comparatively water-tight.

fect of work.—The training wall at Dames Point and the dams at Alligator Cut-
and Coon Point have had the effect of materially increasing the velocity of the
and flood currents in the entire proposed ship channel from Dames Point to

Fulton. This is particularly noticeable in the partially completed channel around Dames Point where the velocity has been increased by nearly a mile an hour. In my opinion, there is not the slightest doubt that the channel to be dredged will be permanent.

The shore protection at St. Johns Bluff has fully come up to all expectations. There has been no washing away of the bank at this place since it has been protected. A portion of the protection mat (for a distance of 700 feet) was covered with shell, a narrow strip of stone being placed on the lower edge of the mat to prevent the waves from turning up the edge. This has now been in position for six months and is in perfect condition, notwithstanding that it has been fully exposed to the frequent northeast storms that have prevailed. For future work of the kind in this vicinity I should recommend that shell be used instead of stone, except on the lower edge of the mat.

The shell used in the jetties has also been found to answer the purpose perfectly. In discharging the shell it was found necessary, generally, to work only during slack water. Aside from this disadvantage, it was found that shell could be handled cheaper than stone.

Future work.—The stability of the cuts below St. Johns Bluff is somewhat doubtful. My own opinion is that having stopped the erosion at St. Johns Bluff the two cuts to be dredged below this point will be permanent, or reasonably so. It may be necessary, however, to direct the flow of water through these cuts by training walls. The mattress used in these dikes deserves, perhaps, special mention.

This mattress was constructed according to the following specifications, viz:

"The mattress will consist of a layer of closely-compacted fascines of live brush of cedar, water oak, gum, myrtle, or any other variety of wood approved by the engineer in charge, crossed at right angles by longitudinal binder of like fascines placed at intervals of 6 feet. The first layer of fascines shall be placed in close juxtaposition and at right angles to axis of the jetty. The binders will be placed on top of the first layer, and shall be parallel to each other and to the axis of the jetty. Each fascine in the first layer shall be fastened securely with jute rope of an approved quality and size to each preceding fascine and to each binder. Wherever it is necessary to splice the binders the lap shall not be less than 3 feet. In making the fascines the brush must be carefully laid so as not to break joints and to make fascines continuous entirely across the mattress. The fascines must contain as much brush as may be required and must be compressed tightly to a diameter of 9 inches at intervals of 2 feet, where they must be bound firmly with iron wire of approved strength. The brush used shall not be greater in size than an inch at the butt."

This design was afterwards modified so as to permit the use of heavy wire as binders instead of fascines. This was found to be capable of much quicker construction and to be stronger than the original design.

Dredging.—The San Francisco Bridge Company began the work of dredging on January 5, 1893. Their dredge, the *Florida*, was built in Jacksonville and was first used on this work. The *Florida* is 125 feet long and 35 feet beam. The principle on which it works is as follows: A truss, called the "ladder," is fitted into a recess in the bow of the hull. The ladder is hinged at a point near the deck of the dredge and is long enough to dredge to a depth of 30 feet from the water surface. At the outer end of the ladder is placed a cylindrical frame 5 feet in diameter and provided with eight knife-shaped blades, which are fastened spirally around the frame. A shaft connects this cutter with an independent engine, placed on the upper end of the ladder and supplied with steam by a flexible pipe. Immediately beneath this shaft is the suction pipe, 20 inches in diameter. This pipe extends from the upper end of the cutter to the centrifugal pump, which is connected directly with a triple-expansion engine. The discharge pipe, also 20 inches in diameter, is carried ashore by means of pontons. This pipe is made of sheet iron and is used in sections 32 feet long. Each section is placed on a ponton, and they are connected between the pontons by a piece of rubber tubing.

The hull is anchored in position by a large spud in the stern. A guy-line is run out from each side of the bow, and the work is done by swinging the dredge on the spud as a center back and forth until the proper depth has been obtained. The average width of the cut is 120 feet, but a cut 140 feet in width can be made by this machine with one swing.

The average number of revolutions of the pump is 220 per minute.

The best work for one day, so far reported, is 5,842 cubic yards for twenty-two hours. The average amount removed per hour is 116 cubic yards.

The dredge is worked day and night.

The work up to date has been confined to Dames Point Cut, and 301,775 cubic yards have been removed. The channel has been completed to full width for a distance of 5,583 feet. The cut has held its own up to date. There has been no shoaling except on the west side of Range No. 2, where the cutting was very deep and a falling in from the side was to be expected. This was allowed for by dredging to a width of 220 feet, so that a channel 200 feet wide has been maintained.

Very respectfully, your obedient servant,

J. H. BACON,
Engineer in Charge.

Maj. J. C. MALLERY,
Corps of Engineers, U. S. A.

REPORT OF MR. E. A. GIESELER, ASSISTANT ENGINEER, UPON THE GAUGING OF THE ST. JOHNS RIVER.

UNITED STATES ENGINEER OFFICE,
St. Augustine, Fla., February 22, 1893.

MAJOR: I have the honor to report as follows upon the gauging of St. Johns River, executed by me between the 12th of August and the 20th of October, 1892, according to the following general plan.

As a basis for the gauging work, tidal observations extending over several months were to be made at numerous points along the tidal portion of the river, and at least one gauge was to be observed at a point well above the tidal limit, in order to obtain an insight into the fresh-water conditons of the river. For the same purpose the fresh-water flow was to be gauged at some upper point, if possible during various stages of the height of the upper river. This upper point was to be located above the region of flood currents, but at the same time sufficiently far down, that the area of the river basin above it formed a considerable part of the entire basin, the object being to determine the fresh-water flow at Mayport, from that one found at the upper point by means of the proportion between the areas of the two basins of precipitation.

Finally the river was to be carefully gauged at Mayport in such a way as to insure the possibility of deducing from the results of the field work the volumes of flow under mean tidal conditions.

The latter work was done between the 12th and the 23d of August.* The gauging of the upper river was executed at Volusia (127 miles above the mouth) at three different dates, viz, first, on July 30, when the river was very low; second, on September 14 and 15, when the river was nearly 2 feet higher, and third, on October 17 when the river was higher yet.

The tidal observations were continued from the latter part of July to the latter part of October at the following points, day and night observations of high and low water being made at Mayport and Jacksonville and day observations only at the other stations:

1. Mayport.
2. Fulton.
3. Dames Point.
4. Jacksonville.
5. Green Cove Springs.
6. Palatka.
7. Welaka.
8. Volusia.

At Mayport day and night observations of high and low water have been continued from the end of April to the end of September, at which time a Stierle self-registering tide gauge was mounted there, which is running still and rendering the usual good results. Besides the above gauges, a river gauge has been observed at St. Francis (formerly Old Town), about 140 miles above the mouth. It should be mentioned here that these observations, which are still continued, are made through the courtesy of Mr. John E. Harris, of St. Francis, without any cost to the Government. They have been of great importance to the success of the work, as they form the criterion of the state of the upper river.

1. Tidal observations.—From the observations made from April 25 to December 8, 1892, at Mayport (in all about 430 observations of the time and height of high and as many of low water), the mean tidal data were computed for this point in the usual way. As the result of this work, I herewith submit the curves of semimenstrual inequality of time and height at Mayport (Sheet No. 1).

To Mayport as a standard the other gauges were referred and their mean tidal data determined by the usual method of comparing simultaneous observations, for which purpose there were available about one hundred observations of high and low water each at each of the points mentioned above. These observations were divided into two groups, one covering the period from July to the early part of September, and one extending from then to the latter part of October. During the former period the upper river was low, while during the latter period it was high, and as the comparison with Mayport was made independently for each group, the influence of the state of the upper river on the height of high and low water is apparent from the results obtained. These are rendered on Sheet No. 2, where th lines of high and low water are shown for a low and a high upper river (gauge a St. Francis, respectively 9.3 and 11.3), and where from the two are found by interpolation those for a mean upper river. As such the reading of 10.3 on the St. Franci gauge has been adopted, which is the average of all daily readings from July 1 to December 31, 1892, during which period the rainfall in the basin of the St. Johns River was about an average one, as will be shown further below.

The influence exercised by the varying state of the upper river on the height o high and low water in the lower river could not be established with certainty an further down than Dames Point. It is probable, though, that greater freshets tha occurred during the time covered by the survey will affect the height of tides dow to the very mouth of the river.

The various data obtained in the above-described way are embodied in the following tables:

TABLE 1.—*Heights of mean high and mean low water on St. Johns River, reduced to th zero level of the Mayport tide gauge.*

Locality.	Upper river low (St. Francis gauge, 9.3).			Upper river high (St. Francis gauge, 11.3).			Upper river average (S Francis gauge, 10.3).		
	Reading of—		Mean rise and fall.	Reading of—		Mean rise and fall.	Reading of—		Mea rise and fall
	High water.	Low water.		High water.	Low water.		High water.	Low water.	
South jetty, outside	......	......	......	......	......	......	5.05	−0.10	5.
South jetty, inside	......	......	......	......	......	......	5.05	0.10	4.
Mayport	......	......	......	......	......	......	4.80	0.50	4.
Fulton	......	......	......	......	......	......	4.18	1.36	2.
Dames Point	3.35	1.48	1.87	3.90	2.25	1.65	3.62	1.86	1.
Jacksonville	2.86	1.86	1.00	3.84	2.96	0.88	3.35	2.41	0
Green Cove Springs	2.74	2.10	0.64	3.81	3.23	0.58	3.28	2.67	0.
Palatka	3.02	2.00	1.02	4.02	3.16	0.86	3.52	2.58	0
Welaka	3.15	2.60	0.55	4.26	3.82	0.44	3.70	3.21	0.

Lower end Lake George, head of tide.

TABLE 2.—*Time of mean high and mean low water on the St. Johns River.*

Locality.	Distance statute miles.	Lunitidal interval.		Duration.		Time of propa gation.	
		H. W.	L. W.	Rise.	Fall.	H. W.	L. W
		h. m.	*h. m.*	*h. m.*	*h. m.*	*h. m.*	*h. m*
South jetty, outside	......	7 25	13 36	6 14	6 11	......	......
South jetty, inside	0.0	7 25	13 42	6 08	6 17	0 00	0
Mayport	1.7	7 38	14 01	6 02	6 23	0 13	0
Fulton	6.5	8 03	14 21	6 07	6 18	0 38	0
Dames Point	11.5	8 24	14 39	6 10	6 15	0 59	0
Jacksonville	23.1	9 07	15 15	6 17	6 08	1 42	1
Green Cove Springs	47.1	12 45	19 45	5 25	7 00	5 20	6
Palatka	80.1	14 55	21 11	6 00	6 16	7 30	7
Welaka	100.1	15 53	22 16	6 02	6 23	8 28	8
Lower end Lake George (head of tide)	110.0	......	......	......	......	......	......

In order to reduce the various gauges to the zero level of the one at Mayport, a has been done on Sheet No. 2 and in Table No. 1, the relative elevations of such gauge had to be determined. No line of levels existing along the St. Johns River abov Mayport, this determination was made from a study of actual and of the mean tid curves and their relative positions in time, the result of which study is rendered o Sheet No. 3. A test of the correctness of the adopted arrangement of the curves i height is furnished by the ebb and flood surface slopes derived from it and platte on Sheet No. 4.

Two characteristics of the St. Johns as a tidal stream are preëminently apparent from the tables and the diagrams, viz, the rapid decline of the tidal wave in the lower portion, of which more will be said further on, and the stability of the duration of ebb and flood up to the head of tide almost. As on the Hudson River, th usual increase of the duration of ebb and decrease of the duration of flood in the upstream direction is not observed, presumably due in both cases to the comparatively small volume of fresh water moving in the river bed.

2. Reduction of pole-float velocities.—No current meters being available at the time se or the commencement of the work at Mayport, it was decided to do it by means of pole floats. In the subsequent office reductions this necessitated a computation of he actual mean velocity from the observed velocity of the pole float, for which purpose no formula exists. In order to obtain a reliable basis for this operation, a series of current meter observations were made as soon as instruments became available. It seems best to give a brief description of this work and its results here, so as to avoid an interruption of the more important matter of the report further on.

The observations were taken in the usual way, by means of a Stackpole propeller meter and electrical recording apparatus, from a boat anchored in the stream on the previously gauged line. Observations were made at depths from 3 to 3 feet and principally extended through the periods of maximum ebb and flood current. From the fieldwork the usual ebb and flood velocity curves were platted and are submitted herewith on four sheets. From these were found the mean velocities at the various depths and during the various important periods principally during maximum ebb and flood current and during the entire duration of ebb current. These mean velocities were then platted on a fifth sheet, submitted herewith, rendering the mean vertical velocity curves for the periods designated above, from which were determined the velocities with which pole floats of various lengths would have moved in each case. The results so found, which are noted in the diagram, were then substituted into Francis's formula,

$$-\sqrt{m}=\sqrt{r}\left\{1-0.116\,(D^{\frac{1}{2}}-N)\right\}$$

and the value of N computed for each individual case. The assumption of N as variable is an innovation first introduced, I believe, by Capt. O. M. Carter, for the purpose of giving the formula a wider scope of application.

The numerous values of N obtained from the available data were satisfactorily uniform, as will be seen from the diagrams, in which they are platted. For the flood current it was found that N was practically equal to zero, while for the ebb current the following table renders the values under various conditions.

TABLE No. 3.—*Values of N during ebb current, for various values of D and various conditions of wind.*

D.	Values of N when wind's direction is—		
	Downstream.	Calm.	Upstream.
0.050	—0.065	—0.020	+0.010
0.100	—0.190	—0.128	—0.066
0.150	—0.280	—0.208	—0.136
0.200	—0.340	—0.270	—0.198
0.250	—0.390	-0.320	—0.250
0.300	—0.425	—0.358	—0.290
0.350	—0.456	—0.390	—0.325
0.400	—0.482	—0.426	—0.340

The designations here and in the above formula are as follows:

$$D=\frac{\text{Depth of water. Immersion of float.}}{\text{Depth of water.}}$$

$\sqrt{m}$ = True mean velocity on vertical.

$\sqrt{r}$ = Velocity of pole float.

The following is submitted in criticism of these results:

It is apparent from the formula that the factor with which the pole-float velocity has to be multiplied, in order to obtain true mean velocity, increases with an increasing N and decreases with a decreasing N, in other words, the excess of pole-float velocity over true mean velocity is the greater the smaller N is, and *vice versa.* Now, during ebb current we invariably have found N greater when the wind is upstream than when it is downstream, in other words, we have found a smaller excess of pole-float velocity in an upstream wind than in a downstream wind. The correctness of this result becomes apparent when we consider that the upstream wind *retards* the velocities of the upper strata and thereby *lessens* the difference between them and the velocities existing in the lower strata, while the downstream wind *accelerates* the upper velocities and thereby *increases* the difference between them and the lower ones.

Similar conditions are found when ebb and flood currents are compared. For the latter we have found N practically at zero, while for the former it is always smaller than zero. That means that the excess of pole-float velocities over true mean velocities has been found to be less during flood than during ebb current, a result the correctness of which becomes apparent when it is considered that the fresh-water flow of a tidal river has the tendency, on account of its lower specific gravity, to make itself more felt in the upper strata than in the lower ones, and that its action on the velocities in such upper strata will therefore be a *retarding* one during flood current and a *accelerating* one during ebb current.

The above values for N have been employed to compute the required corrections of the tidal velocities found at Mayport.

3. The fresh-water flow of the St. Johns.—I now proceed to discuss the work done on the upper river for the purpose of determining the fresh-water flow of the St. Johns.

In selecting the locality at which the river was to be gauged the following considerations suggested themselves:

Between Jacksonville and Palatka the cross-sectional areas of the river are very great (varying between about 80,000 and 150,000 square feet) as compared with the volume moving in the river; the velocities are, therefore, small, and as the river is very wide (nearly 2 miles on the average) it would be very difficult and time robbing to eliminate the effect of wind from current observations made on this stretch. For these reasons good results can be obtained within a reasonable time only above Palatka.

Although between Palatka and Lake George the river is very much narrower than on the stretch just mentioned, still even here the widths are sufficiently great to allow even slight winds to affect the very low velocities in a way which it would be very difficult to determine exactly. Besides this, the current runs flood almost as far as Lake George, thus introducing another complicating element. For these reasons it was thought advisable to select a point in the narrow and wind-sheltered portion of the river immediately above Lake George, where no flood current is experienced even when the upper river is low.

The locality decided upon, Volusia, is about 5 miles above Lake George and about 127 miles above the mouth. According to the best information available the area of the river basin above Volusia is about 3,000 square miles, while the area of the entire basin is about 8,100 square miles. Assuming an equal coefficient of efflux at Volusia and at the mouth this proportion applied to the results found for the former point would render the fresh-water flow at the latter point.

The gauging was done by means of pole floats which were started from three buoys anchored across the width of the river (which here is about 380 feet), and the passage of which through an upper and a lower range, 100 feet apart, was observed from the shore. The observations were in all cases continued long enough to show clearly the conditions of flow prevailing throughout an entire tide (twelve hours and twenty-five minutes). This was necessary because the flood current, although never actually making its appearance, still made itself felt by a considerable slacking of the current at certain periods.

The results obtained were computed and platted in the usual way and are herewith submitted on three sheets. The reduction of pole-float velocity to mean velocity was made according to Francis's formula, the values of N being those given for various values of D by Capt. O. M. Carter. In the following table are rendered the condensed results found for the fresh-water volume at Volusia.

Résumé of gauging work at Volusia.

Date.	Hours observed.	Number of observations.	Volume during 12h 25m.	Force and direction of wind.
			Cubic feet.	
July 30	10	100	71,800,000	Down light.
September 14	8	120	119,700,000	Down light.
September 15	11	180	103,000,000	Up light.
October 17	10½	240	230,600,000	Almost calm.

With reference to the state of the upper river, we therefore have the following conditions of fresh-water flow at Volusia.

TABLE NO. 4.—*Volumes of fresh-water flow at Volusia and corresponding height of river.*

Date.	Reading of guage at St. Francis.	Volume of fresh water—		Mean velocity.
		During 12h 25m.	During 1 second.	
		Cubic feet.	*Cubic feet.*	
July 30	8.9	71,800,000	1,606	0.2
September 14 and 15	10.7	111,400,000	2,492	0.
October 17	11.5	230,600,000	5,159	0.6

These results have been platted in the usual way, the gauge readings as the ordinates and the corresponding discharges as the abscissas, and from the three points thus obtained the curve of discharge at Volusia has been constructed on sheet No. 5. By means of this curve and on the basis of the daily observations of the St. Francis gauge the discharge at Volusia during twelve hours and twenty-five minutes has been determined for each day from the 1st of July to the 31st of December, 1892, and is rendered in the following table.

TABLE 5.—*Readings of river gauge at St. Francis from July 1 to December 31, 1892, and corresponding volumes of discharge at Volusia.*

[In million cubic feet per 12 hours 25 minutes.]

Date.	July.		August.		September.		October.		November.		December.	
	Gauge.	Discharge.	Gauge.	Discharge.	Gauge.	Discharge.	Gauge.	Discharge.	Gauge.	Discharge.	Gauge.	Discharge.
1......	9.10	75	8.90	72	9.66	84	11.70	297	11.16	158	10.50	105
2......	9.10	75	8.86	71	9.75	86	11.75	310	11.08	138	10.50	105
3......	9.10	75	9.0	73	9.83	88	11.77	317	11.00	129	10.50	105
4......	9.10	75	9.04	74	9.95	91	11.80	323	10.92	122	10.50	105
5......	9.08	75	9.08	75	9.87	89	11.80	323	10.83	117	10.42	102
6......	9.08	75	9.08	75	10.08	93	11.75	310	10.83	117	10.42	102
7......	9.08	75	9.08	75	10.16	95	11.70	207	10.83	117	10.42	102
8......	9.08	75	9.12	75	10.33	100	11.70	297	10.83	117	10.42	102
9......	9.08	75	9.16	75	10.45	103	11.67	289	10.83	117	10.42	102
10......	9.08	75	9.16	75	10.58	107	11.67	289	10.83	117	10.42	102
11......	9.08	75	9.20	76	10.80	116	11.65	284	10.83	117	10.46	103
12......	9.08	75	9.27	78	10.87	119	11.62	276	10.80	116	10.46	103
13......	9.08	75	9.29	78	10.83	117	11.58	266	10.75	113	10.46	103
14......	9.08	75	9.31	78	10.77	114	11.58	266	10.70	112	10.33	100
15......	9.08	75	9.33	78	10.70	112	11.54	256	10.65	109	10.33	100
16......	9.08	75	9.42	80	10.75	114	11.50	245	10.65	109	10.33	100
17......	9.08	75	9.60	83	10.83	117	11.46	234	10.60	108	10.16	95
18......	9.08	75	9.66	84	10.83	117	11.42	224	10.54	106	10.16	95
19......	9.08	75	9.75	86	10.87	119	11.42	224	10.50	105	10.08	93
20......	9.08	75	9.83	88	10.91	121	11.33	201	10.46	103	10.00	92
21......	9.08	75	9.83	88	11.00	128	11.33	201	10.46	103	10.00	92
22......	9.08	75	9.85	88	11.14	154	11.33	201	10.46	103	9.90	89
23......	9.08	75	9.87	89	11.20	165	11.33	201	10.46	103	9.85	88
24......	9.08	75	9.87	89	11.31	195	11.33	201	10.46	103	9.85	88
25......	9.08	75	9.87	89	11.31	195	11.33	201	10.50	105	9.85	88
26......	9.08	75	9.85	88	11.31	195	11.54	256	10.50	105	9.85	88
27......	9.08	75	9.79	87	11.25	181	11.54	256	10.50	105	9.80	87
28......	9.08	75	9.75	86	11.25	181	11.50	245	10.50	105	9.80	87
29......	9.00	73	9.70	85	11.33	202	11.42	224	10.50	105	9.80	87
30......	8.91	72	9.58	83	11.50	245	11.37	210	10.50	105	9.80	87
31......	8.91	72	9.58	83	....	....	11.25	181	....	....	9.80	87

The means of the 184 individual figures of this table are as follows:

Means of St. Francis gauge readings and Volusia discharge during the six months from July 1 to December 31, 1892.

Mean reading of gauge at St. Francis	feet..	10.3
Mean discharge at Volusia in 12 hours 25 minutes	cubic feet..	125,200,000

In order to determine from this the general average discharge at Volusia, we have now to consider the conditions of rainfall under which the above discharge took place and their proportion to mean rainfall. In the following table are given the heights of rainfall at different points in and near the St. Johns River Basin during the period in question:

TABLE 6.—*Height of rainfall in inches at various points near the St. Johns River from July 1 to December 31, 1892.*

Locality.	July.	August.	September.	October.	November.	December.	Total.
Federal Point..................................	2.50	12.10	13.51	3.32	0.05	1.80	33.28
Green Cove Springs..........................	5.72	9.09	15.83	6.11	0.15	1.60	38.50
Jacksonville....................................	3.16	4.84	14.04	3.34	0.64	2.62	28.54
Jupiter..	0.08	2.80	14.43	14.00	0.89	4.44	36.64
Merritts Island................................	5.03	2.37	8.04	3.59	0.40	1.66	21.09
St. Augustine..................................	1.13	7.36	14.50	3.40	0.15	1.77	28.31
Titusville.......................................	0.97	2.24	16.67	6.75	0.56	2.41	29.60

Average total precipitation from July 1 to December 31, 1892, 30.85.

The only place near the St. Johns River at which observations of rainfall have been made for an extended period is Jacksonville. From a series of twenty years we find for this place an annual mean of about 55 inches. The short series available for Titusville and for Jupiter appear to indicate that the annual mean in the upper portion of the river basin is somewhat greater. We can not, therefore, be far out of the way by assuming the mean annual rainfall throughout the entire basin of the St. Johns River to be somewhere between 55 and 60 inches. As the average of all the heights of rainfall given in Table No. 6 corresponds very well with these figures, we may assume that during the period from the 1st of July to the 31st of December, 1892, average conditions of rainfall have prevailed in the basin of the St. Johns River, which would lead to the inference that the mean discharge found for this period may be looked upon generally as the average discharge of the river at Volusia. Applying to this the proportion of the area of the entire basin to the area above Volusia (8,100 to 3,000) we now obtain: Mean volume of fresh water flow at Mayport during the six months from July 1 to December 31, 1892, during a mean tide of 12 hours 25 minutes, 338,000,000 cubic feet. During one second, 7,564 cubic feet.

While the conditions of rainfall during our period of observation were found to correspond very closely to average ones, it should be mentioned here that during the preceding six months the rainfall in the basin of the St. Johns appears to have been abnormally small, as will be apparent from the following data:

TABLE 6ª.—*Height of rainfall in inches at various points near the St. Johns River from January 1 to June 30, 1892.*

Locality.	January.	February.	March.	April.	May.	June.	Total.
Federal Point	0.29	0.26	2.00	0.77	1.16	8.07	12.55
Green Cove Springs	3.44	0.30	0.90	0.30	1.71	7.64	14.29
Jacksonville	3.99	0.77	0.76	0.11	1.34	6.38	13.35
Jupiter	2.56	2.70	3.76	0.53	2.30	14.76	26.61
Merritts Island	0.42	2.77	0.56	1.04	3.13	5.83	13.75
Micco	0.70	2.97	1.41	3.06	2.42	11.72	22.28
Titusville	1.07	2.09	1.30	1.08	3.80	8.76	18.10

Average total precipitation from January 1 to June 30, 1892, 17.28 inches.

It is probable that the influence of the preceding dry period extends into the period of observation immediately following it, and that, therefore, the true average fresh-water discharge of the St. Johns is somewhat greater than found above. While it is impossible to determine the amount of the difference, still a maximum limit can be stated, greater than which it can not be. Assuming the average height of rainfall in the basin of the St. Johns during the entire year 1892, on the basis of tables 6 and 6ª, at 48 inches, then the average fresh-water discharges, as determined from gauge observations extending over the entire year, would have been only $\frac{48}{58}$ of the true mean discharge—that is it would have been found 25 per cent too small. Now clearly the difference for the second half year during which normal conditions prevailed must have been less than this—that is the amount by which the average Mayport fresh-water flow has been found too small must be less than 85,000,000 cubic feet. While this would put the outside limit of the true mean fresh-water discharge at Mayport during 12 hours and 25 minutes at about 422,000,000 cubic feet, it is probable that this quantity really ranges somewhere between 340,000,000 and 400,000,000 cubic feet.

For a very low river (St. Francis gauge, 8.75) we find from Sheet No. 5 a fresh-water flow at Volusia of 70,000,000 and consequently one at Mayport of 189,000,000 cubic feet.

The highest state of the river of which any record could be obtained occurred in October, 1891, with a reading of 13.25 at the St. Francis gauge. For this state of the river we infer from Sheet No. 5, a discharge of about 600,000,000 cubic feet at Volusia, and consequently one of about 1,600,000,000 cubic feet at Mayport, figures that can be given as very approximate only. Recapitulating all these results we have—

TABLE NO. 7.—*Volumes of fresh-water flow at Mayport.*

1. When the river is at an average state:		
Discharge in 12 hours 25 minutes	cubic feet..	370,000,000
Discharge in 1 second	do....	8,280
2. When the river is at lowest recorded stage (St. Francis gauge, 8.75):		
Discharge in 12 hours 25 minutes	cubic feet..	189,000,000
Discharge in 1 second	do....	4,230

3. When the river is at highest recorded stage (St. Francis gauge, 13.25):

Discharge in 12 hours 25 minutes	cubic feet..	1,600,000,000
Discharge in 1 second	do....	35,800

The obvious characteristic of the St. Johns apparent from this table is the remarkable uniformity of its flow. Its maximum fresh-water discharge appears to be only about nine or ten times greater than the minimum discharge, a difference many times smaller than is ever found in rivers and streams situated in hilly or mountainous country.

It should finally be mentioned that, under the assumption of an annual rainfall of 60 inches, the figures rendered in Table 7 place the coefficient of efflux under mean conditions at about 0.23, a figure very close to Gen. Gillmore's estimate of 1879, and considerably less than was estimated by me in my preliminary report to you of June 30, 1892.

For the comparison of the results of the fresh-water gauging with those of the tidal gauging at Mayport, it becomes necessary to determine the time consumed in the propagation of a given condition of fresh-water flow (or a given state of the upper river) from Volusia to the mouth. For this purpose the gauge readings taken at St. Francis, at Jacksonville, and at Dames Point have been platted on Sheet No. 5, and from a study of them it becomes apparent that the variations of the state of the river at St. Francis make themselves felt as far down as Dames Point practically simultaneously. The commencement at St. Francis of the decided rise on August 15, the high stage of the river on September 11 and 12, and again on October 26 and 27, they all are reflected simultaneously in similar conditions at Jacksonville and at Dames Point, conditions that could not have been produced there by tidal causes, as the three periods above mentioned are periods of neap tide.

We therefore arrive at the conclusion that the conditions of fresh-water flow prevailing at any time at Volusia prevail simultaneously at Mayport. The cause of this is undoubtedly to be sought in the great extent of the tidal portion of the river which reaches to within less than 20 miles of Volusia.

4. *Gauging work done at Mayport.*—It has been stated already that this work was done by means of pole floats, no current meters being available at the time.

A line was laid out across the river near the Government pier, its shore ends being marked by a flagstaff on each shore; 100 feet above it and the same distance below it lines parallel to it were laid out and marked in a similar way; each of the three lines was then carefully sounded. The three cross sections obtained in this way are rendered on Sheet No. 7 and marked lower cross section, center cross section, and upper cross section. During the ebb the boats from which the floats were started would drop anchor on the upper range and then pay out lines until they were about 20 feet above the center range; the passage of the floats would then be observed on this and on the lower range. During the flood the boats would drop anchor on the lower range and then pay out line until they were about 20 feet below the center range; the passage of the floats would then be observed on this and on the upper range. The picking up and returning of the floats to the starting point was done by the naphtha launch.

It was attempted first to fix the positions of the seven points on which gauging was to be done by means of can buoys anchored on the center range. But these were interfered with to such an extent by passing vessels, that in their stead upriver ranges were selected, the intersection of which with the center line gave the desired points. As a check on the correctness of the boat's positions instrumental observations were taken from the shore on each day for flood as well as for ebb position.

The mean low-water depths at the buoy's range between about 15 and 35 feet and the immersed lengths of floats employed varied between 14 and 30 feet. The difference between depth and immersed length of float in most cases was less than two-tenths of the depths, and only in one case runs up as high as two-sevenths.

Observations were made on August 12, 13, 15, 16, 17, 18, 20, 22, and 23. By commencing work very early in the morning and continuing it until dark it was generally possible to get a complete flood and a complete ebb in one day, although about an hour was lost each morning in bringing the boats into position and in other preparations. Work was done on three verticals simultaneously each day, and the general plan was to have the work of one day overlap that of the next day in this way, that there would be at least one vertical in common on both days. On account of the low and flat banks of the river the volume of discharge can be assumed as proportional to the range of tide only within very small limits; beyond that the volume must increase in a much greater ratio on account of the additional areas of lowlands covered. It was, therefore, decided to continue observations until ebb as well as flood had been observed under tidal conditions approaching the mean very closely, so as to confine subsequent reduction, if at all required, to small limits. Accordingly the date of commencing operations was selected so that during the first few days ebb and flood tides approaching, the mean might be expected. As a matter of fact ebb tides approaching mean conditions were obtained almost from the beginning throughout the entire duration of work, while approximately mean flood tides were not obtained before the last two days.

The fieldwork was computed and platted in the usual way and the resulting curves of the pole-float velocity are submitted herewith on nine sheets. From these curves the total lengths were computed that each float would have traveled had it been under the continuous influence of the current of the gauged locality, during the entire gauged ebb, respectively, flood; these lengths are rendered in Table No. 8, and the further progress of the work of computation is explained by a series of tables following this, viz:

In Table No. 9 is given the average depth at each vertical during each gauged tide and the immersed length of float employed. From this, in connection with Francis' formula and the values of N as found above, the true lengths of ebb and flood flow (as they would have been observed if the float in each case had reached to the bottom) have been computed and are given in Table No. 10. The product of these, and the cross-sectional areas pertaining to them, would now render the volumes of discharge.

These cross-sectional areas, that is, the area of compartment pertaining to each vertical for each observed ebb or flood flow, may be considered to consist of two portions, viz: that below and that above the mean low-water lines. The former is constant and is easily found from Sheet No. 6, on which the position of verticals is given for ebb and for flood. The latter is variable and depends upon the average elevation of surface above mean low water during the observed ebb or flood flow. In order to determine this, the tidal curves were platted from the readings taken at Mayport for each ebb and flood, the currents of which were observed. On these curves, which are submitted herewith on four sheets, the mean low-water lines and the time of change of current are shown; the average height of the ebb and flood ordinates above such mean low-water line was determined by a simple process of addition and division. The height thus found, multiplied by the width of the compartment, then rendered the amount to be added to the portion of the compartment below mean low-water in order to obtain the entire area. It remains to say that the compartments 1 and 7 were assumed not to extend to the shore, but only to within about 100 feet from it; from this point the length of flow found at vertical 1 and at vertical 7 was assumed to gradually decline to zero at the shore. Besides the compartments pertaining to the verticals, there is therefore an additional one at each shore, the corresponding length of flow of which is half the length of flow of the nearest vertical. The areas of compartments found in the described way are rendered in Table No. 11, and the products of these and the true lengths of flow of Table No. 10, that is, the volumes of discharge as found by gauging, are given in Table No. 12.

TABLE 8.—*Length of flow at Mayport in feet, as observed by pole floats.*

1. EBB.

Number of vertical.	Aug. 12 (H. W., 4.85; L. W.—0.25).	Aug. 13 (H. W., 4.95; L. W., 0.25).	Aug. 16 (H. W., 4.55; L. W., 0.45).	Aug. 17 (H. W., 4.20; L. W., 0.35).	Aug. 18 (H. W., 4.70; L. W., 0.35).	Aug. 20 (H. W., 4.55; L. W., 0.35).	Aug. 22 (H. W., 4.70; L. W., 0.35).	Aug. 23 (H. W., 4.80; L. W., 0.45).
1	51,768	....	....	....	....	....	....	....
2	54,756	....	....	....	....	....	....	51,480
3	47,556	52,506	52,704	47,412	....	....	....	48,504
4	....	44,586	49,320	45,756	....	46,188	49,932	43,416
5	....	42,552	42,876	40,572	42,228	41,076	44,892	....
6	....	....	....	....	40,428	39,708	41,364	....
7	....	....	....	....	42,660	....	....	....

2. FLOOD.

Number of vertical.	Aug. 12 (L. W., —0.45; H. W., 4.85).	Aug. 13 (L. W., —0.30; H. W., 4.95).	Aug. 15 (L. W., 0.45; H. W., 5.25).	Aug. 16 (L. W., 0.45; H. W., 5.15).	Aug. 17 (L. W., 0.35; H. W., 5.25).	Aug. 18 (L. W., 0.35; H. W., 5.35).	Aug. 22 (L. W., 0.45; H. W., 4.70).	Aug. 23 (L. W., 0.35; H. W., 4.80).
1	9,432	....	....	....	....	....	....	....
2	39,888	....	....	....	....	....	....	32,220
3	43,668	50,184	55,836	51,480	53,424	....	....	36,576
4	....	53,820	60,696	54,252	56,736	....	46,788	37,080
5	....	53,496	52,236	50,832	55,404	63,360	27,224	....
6	....	....	....	....	....	56,772	36,252	....
7	....	....	....	....	....	45,612	....	....

NOTE.—At the head of each column of this table the Mayport high and low water pertaining to the gauged tide is given.

TABLE 9.—*Average depth of water (D) and immersed length of float (L).*

1. EBB.

No. of vertical.	Aug. 12 (almost calm).		Aug. 13 (down, light).		Aug. 16 (across, light).		Aug. 17 (up, light).		Aug. 18 (up, moderate).		Aug. 20 (up, moderate).		Aug. 22 (across, very light).		Aug. 23 (across, fresh).	
	D.	L.	D.	L.	D.	L.	D.	L.	D.	L.	D.	L.	D.	L.	D.	L.
1	17.0	14.3														
2	19.0	17.5														
3	22.0	19.0	21.5	16.0	22.0	17.0	22.0	17.0							20.3	17.0
4			24.3	22.0	26.0	19.0	26.0	19.0			26.5	24.0	26.1	22.0	22.0	19.0
5			30.0	26.0	30.5	22.0	30.5	23.0	30.5	26.0	30.5	30.0	30.6	26.0	26.0	22.0
6									35.5	30.0	35.5	30.0	35.6	30.0		
7									20.5	15.0						

2. FLOOD.

No. of vertical.	Aug. 12 (across, moderate).		Aug. 13 (down, very light).		Aug. 15 (down, moderate).		Aug. 16 (across, light).		Aug. 17 (up, moderate).		Aug. 18 (up, fresh).		Aug. 22 (down, very light).		Aug. 23 (almost calm).	
	D.	L.	D.	L.	D.	L.	D.	L.	D.	L.	D.	L.	D.	L.	D.	L.
1	20.5	14.3														
2	23.6	18.0													22.0	19.0
3	24.2	19.0	24.3	19.0	24.6	19.0	24.5	19.0	24.5	22.0					24.3	22.0
4			27.0	22.5	29.0	22.0	28.4	22.0	29.0	26.0			28.5	26.0	28.7	26.0
5			32.2	26.0	33.0	26.0	32.9	26.0	33.0	30.0	32.5	26.0	32.5	30.0		
6											37.8	30.0	37.5	30.0		
7											20.0	15.0				

NOTE.—At the head of each column of this table is given direction and force of wind prevailing during the gauged tide, "up" designating the direction from mouth to Jacksonville, and *vice versa*.

TABLE 10.—*True lengths of flow at Mayport, in feet.*

1. EBB.

No. of vertical.	Aug. 12.	Aug. 13.	Aug. 16	Aug. 17.	Aug. 18.	Aug. 20.	Aug. 22.	Aug. 23.
1	48, 041							
2	51, 800							47, 773
3	44, 465	47, 413	47, 961	43, 145				45, 456
4		42, 357	44, 437	41, 226		44, 248	46, 337	40, 377
5		39, 872	38, 546	36, 718	39, 736	40, 296	41, 750	
6					37, 921	37, 264	38, 386	
7					38, 821			

2. FLOOD.

No. of vertical.	Aug. 12.	Aug. 13.	Aug. 15.	Aug. 16.	Aug. 17.	Aug. 18.	Aug. 22.	Aug. 23.
1	8, 828							
2	37, 654							30, 834
3	41, 310	47, 474	52, 709	48, 649	51, 447			35, 260
4		51. 290	57, 236	51, 268	54, 637		39, 401	35, 745
5		50, 768	49, 467	48, 138	53, 465	60, 065	36, 033	
6						53, 763	34, 367	
7						42, 966		

TABLE 11.—*Cross-sectional areas of compartments during gauging work, in square ft.*

1. EBB.

Compartment.	Aug. 12.	Aug. 13.	Aug. 16.	Aug. 17.	Aug. 18.	Aug. 20.	Aug. 22.	Aug.
Shore	958							
1	3, 464							
2	5, 900							[illegible]
3	5, 433	5, 483	5, 557	5, 520				[illegible]
4		5, 190	5, 250	5, 220		5, 230	5, 240	[illegible]
5		5, 207	5, 258	5, 233	5, 250	5, 241	5, 250	
6					6, 280	6, 271	6, 280	
7					1, 850			
Shore					980			

2. FLOOD.

Compartment.	Aug. 12.	Aug. 13.	Aug. 15.	Aug. 16.	Aug. 17.	Aug. 18.	Aug. 22.	Aug.
Shore	1, 065							
1	3, 065							
2	8, 118							[illegible]
3	5, 285	5, 296	5, 362	5, 340	5, 351			[illegible]
4		6, 271	6, 337	6, 315	6, 326		6, 238	[illegible]
5		6, 535	6, 595	6, 575	6, 585	6, 605	6, 505	
6						7, 143	7, 048	
7						2, 115		
Shore						960		

TABLE 12.—*Gauged volumes of discharge at Mayport, in millions of cubic feet.*

1. EBB.

Compartment.	Aug. 12.	Aug. 13.	Aug. 16.	Aug. 17.	Aug. 18.	Aug. 20.	Aug. 22.	Aug.
Shore	23. 0							
1	166. 4							
2	305. 6							[illegible]
3	241. 6	260. 0	266. 5	238. 2				[illegible]
4		219. 8	233. 3	215. 2		231. 4	242. 8	[illegible]
5		207. 6	202. 7	192. 1	208. 6	211. 2	219. 2	
6					238. 1	233. 7	241. 0	
7					71. 8			
Shore					19. 0			

2. FLOOD.

Compartment.	Aug. 12.	Aug. 13.	Aug. 15.	Aug. 16.	Aug. 17.	Aug. 18.	Aug. 22.	Aug.
Shore	4. 7							
1	27. 1							
2	305. 7							[illegible]
3	218. 3	251. 4	282. 6	259. 8	275. 3			[illegible]
4		321. 6	362. 7	323. 8	345. 6		245. 8	[illegible]
5		331. 8	326. 2	316. 5	352. 1	396. 7	234. 4	
6						384. 0	242. 2	
7						90. 9		
Shore						20. 6		

For compartment 2 the ebb volume of August 23 corresponds almost exactly
mean tidal conditions, and the one of August 12 is therefore left out. For compa
ments 3 to 7 ebb volumes corresponding to an approximately mean tide are fou
from those in Table No. 12 by taking the average of all days. The tidal conditi
corresponding to each of these volumes are found by taking the average of t
heights of high and of low water on the days in question, as given in the headin

of Table No. 8. As will be seen from Table No. 13 the resulting figures are in nearly all cases satisfactorily close to Mayport figures for mean high and mean low water as rendered in Table No. 1. Only in the case of compartment 1 and its shore compartment there is a considerable departure of the tidal conditions from the mean.

For the flood volumes we have only two days with tidal conditions approaching the mean closely, viz, August 22 and 23. On all other days the range is much too great and more than that, on nearly all of them the height of high water is very considerably above the mean, thus causing a great excess of volumes for reasons above mentioned. On the two good days available the five most important verticals have been gauged. We are therefore compelled to fall back on days of high tides only for the comparatively unimportant compartments 1 and 7 and their shore compartments. As there are overlapping observations in each case the required reduction has been made by applying the proportion between these to the figures for 1 and 7.

In the case of vertical 1 this proportion is found from the volumes observed for 2 and 3 on August 12 and 23, from which we find that the factor of reduction for the volumes observed on August 12 is 0.84. In the same way we find, from the volumes observed for 5 and 6 on August 18 and 22 that the factor of reduction for the former day is 0.61.

In Table No. 13 are rendered the ebb and flood volumes found as described above from the figures of Table No. 12 and corresponding to approximately mean conditions of tide at Mayport.

TABLE 13.—*Volumes of discharge at Mayport corresponding to approximately mean tidal conditions, in million of cubic feet.*

1. EBB.

Compartment.	Individual results.			Corresponding average.	
	Number.	Aggregate sum.	Average.	High water.	Low water.
Shore	1	23.0	33.0	4.85	—0.25
1	1	166.4	166.4	4.85	—0.25
2	1	291.2	291.2	4.80	0.45
3	5	1,260.6	252.1	4.67	0.25
4	6	1,355.7	225.8	4.62	0.37
5	6	1,241.4	206.9	4.61	0.35
6	3	712.8	237.6	4.63	0.32
7	1	71.8	71.8	4.70	0.35
Shore	1	19.0	19.0	4.70	0.35
Total discharge	....	....	1,493.8	....	....

2. FLOOD.

Compartment.	Number.	Aggregate sum.	Average.	High water.	Low water.
Shore	Reduced from 1	0.84× 4.7	3.9	....	....
1	Reduced from 1	0.84×27.1	22.8	....	....
2	1	251.4	251.4	0.35	4.80
3	1	187.1	187.1	0.35	4.80
4	2	470.4	235.2	0.40	4.75
5	1	234.4	234.4	0.45	4.70
6	1	242.2	242.2	0.45	4.70
7	Reduced from 1	0.61×90.9	55.4	....	....
Shore	Reduced from 1	0.61×20.6	12.6	....	....
Total discharge	....	....	1,245.0	....	....

While a great part of the flood volumes rendered in Table No. 12 can not be employed directly for the determination of the mean volumes, they can, however, be utilized as follows, as a valuable check on the correctness of the figures given in Table No. 13. From the flood volumes of August 13, 15, 16, and 17, Table No. 12, we find the following means:

Compartment 3	cubic feet	267,300,000
Compartment 4	do	338,400,000
Compartment 5	do	331,600,000

the proportion between which may be expressed thus:

Compartment 3	1.00
Compartment 4	1.27
Compartment 5	1.24

Computing the proportion between the volumes of the same compartments from Table No. 13 we obtain

Compartment 3	1.00
Compartment 4	1.26
Compartment 5	1.25

which figures are satisfactorily close to those above and afford good additional evidence of the correctness of the volumes rendered for the three compartments in Table No. 13.

In order to exactly determine the tidal conditions to which the total volumes of Table No. 13 correspond, we now compute the mean of the tidal conditions corresponding to the individual compartments in this way, that each individual figure is given the weight due to it according to the discharge volume of its vertical:

Computation of tidal conditions corresponding to total volumes of Table No. 13.

Ebb.		Flood.	
High water.	Low water.	Low water.	High water.
1.9×4.85= 9.22	1.9× −0.25=−0.48	....	....
2.9×4.80=13.92	2.9× 0.45= 1.31	2.5×0.35=0.88	2.5×4.80=12.00
2.5×4.67=11.67	2.5× 0.25= 0.63	1.9×0.35=0.66	1.9×4.80= 9.12
2.3×4.62=10.63	2.3× 0.37= 0.85	2.4×0.40=0.96	2.4×4.75=11.40
2.1×4.61= 9.68	2.1× 0.35= 0.74	2.3×0.45=1.04	2.3×4.70=10.81
2.4×4.63=11.11	2.4× 0.32= 0.77	2.4×0.45=1.08	2.4×4.70=11.28
0.9×4.70= 4.23	0.9× 0.35= 0.31	....	....
15.0 70.46	15.0 4.13	11.5 4.62	11.5 54.61
Mean ...4.70	Mean 0.27	Mean ...0.40	Mean ...4.75

From the figures it is seen that the total ebb volume of Table No. 13 corresponds to a Mayport tidal fall of 4.43 feet, and that the total flood volume corresponds to a rise of 4.35 feet. The mean rise and fall at Mayport having been found to be only 4.30 feet, it would seem, then, that both volumes are somewhat greater than the mean, the ebb volume by $\frac{1}{34}$ and the flood volume by $\frac{1}{87}$. It will be seen below that the introduction of these corrections would cause a better coincidence of the present results with the fresh water volume as found from the Volusia gauging work. But it should be considered here that the excess of the ebb volumes for August 12, as indicated by the tidal fall of that day, is not corroborated by the proportion of the volumes found to those found in the same compartments on other days. The aggregate volume of compartments 2 and 3 is found at almost exactly the same figure on August 23, when the fall was very near the mean. It would therefore not seem advisable to include compartment 1 and its shore compartment into the correction. If, accordingly, the tidal conditions corresponding to the total ebb volume of Table 13 are computed without considering them, we find 4.68 for the high and 0.35 for the low water, which reduces the probable deviation of the ebb volume from the mean to about the same as that found for the flood volume, both of them being so small that it appears best to let the volumes stand as rendered by Table No. 13.

5. Checks on the results of the Mayport gauging work.—The first check on the Mayport results consists in the comparison of the difference of ebb and flood volumes with the volume of fresh-water flow, which should be equal. In order to find the latter for the days in question, we multiply the figures of Table No. 5 by 2.7 (the proportion between the entire drainage area and the one above Volusia). From the volumes so obtained the fresh-water flow per second is found by dividing with 44700 (12 hours 25 minutes) as follows:

Fresh-water flow in cubic feet per second at Mayport.

	Cubic feet.
August 12	4,711
13	4,711
15	4,711
16	4,832
17	5,013
18	5,074
20	5,315
22	5,315
23	5,376

We further determine from the velocity curves the duration of flow on each day, the result being rendered in Table No. 14.

TABLE 14.—*Duration of flow in seconds observed at Mayport.*

1. EBB.

No. of vertical.	Aug. 12	Aug. 13	Aug. 16	Aug. 17	Aug. 18	Aug. 20	Aug. 22	Aug. 23
1	26,700							
2	26,000							24,300
3	24,600	24,100	25,600	24,000				23,700
4		23,600	25,100	24,000		23,400	23,400	22,800
5		23,700	24,500	23,200	24,000	23,700	24,600	
6					23,900	23,700	23,700	
7					23,800			

2. FLOOD.

No. of vertical.	Aug. 12	Aug. 13	Aug. 15	Aug. 16	Aug. 17	Aug. 18	Aug. 22	Aug. 23
1	17,400							
2	18,000							18,300
3	18,600	20,400	21,600	21,100	21,600			18,700
4		20,500	22,300	21,800	22,300		19,800	19,500
5		20,900	22,200	22,400	22,900	23,400	19,800	
6						23,700	20,100	
7						23,700		

The products of the discharge per second and the figures of Table No. 14 now render the volume of fresh water during each individual gauged ebb and flood, as given in Table No. 15. This table is arranged in a similar way as all other tables referring to the Mayport work, but this has been done merely for convenience of reference, and it is, of course, not to be understood as if volumes given in the table referred to the individual compartments. They represent in each case the fresh-water flow of the entire gauged cross section during the entire duration of the gauged ebb or flood.

TABLE 15.—*Volume of fresh-water flow in million cubic feet at Mayport during each gauged ebb and flood.*

I. EBB.

No. of vertical.	Aug. 12.	Aug. 13.	Aug. 16.	Aug. 17.	Aug. 18.	Aug. 20.	Aug. 22.	Aug. 23.
1	125.8							
2	122.5							130.6
3	115.9	113.5	123.7	123.3				127.4
4		111.2	121.3	120.3		124.4	124.4	122.6
5		111.6	118.4	116.3	121.8	126.0	130.8	
6					121.3	126.0	126.0	
7					120.8			

2. FLOOD.

No. of vertical.	Aug. 12.	Aug. 13.	Aug. 15.	Aug. 16.	Aug. 17.	Aug. 18.	Aug. 22.	Aug. 23.
1	82.0							
2	84.8							98.4
3	87.6	96.1	101.8	102.0	108.3			100.5
4		96.6	105.1	105.2	111.8		105.2	104.8
5		98.5	104.6	108.2	114.8	118 7	105.2	
6						120.3	106.8	
7						120.3		

From the figures of Table No. 15 we obtain the fresh-water flow to be consider in the case of each vertical by averaging the same days that have been averag in Table No. 13.

Volume of fresh-water flow at Mayport to be considered in the case of each vertical.

Vertical.	Ebb.	Flood.
	Cubic feet.	*Cubic fe*
1	125,800,000	82.0
2	130,600,000	98.4
3	120,800,000	100,5
4	120,700,000	105.0
5	120,890,000	105,2
6	124,400,000	106.8
7	120,800,000	120,3

The mean volumes of fresh-water flow during the gauging work are now found b averaging the above figures in this way that each of them is given the weight d to it according to the tidal discharge volume of its vertical.

Computation of mean volume of fresh-water flow at Mayport during gauging work.

Vertical No.	Ebb.		Flood.	
	Million cubic feet.		*Million cubic fe*	
1	1.9 × 125.8=	239.0	0.8 × 82.0=	
2	2.9 × 130.6=	378.7	2.5 × 98.4=	
3	2.5 × 120.8=	302.0	1.9 × 100.5=	1
4	2.3 × 120.7=	277.6	2.4 × 105.0=	
5	2.1 × 120.8=	253.7	2.3 × 105.2=	
6	2.4 × 124.4=	298.6	2.4 × 106.8=	
7	0.9 × 120.8=	108.7	0.7 × 120.3=	
	15.0	1,858.3	12.5	1,
Mean	$\frac{1,858.3}{15}$=1,23.9		$\frac{1,296.8}{12.5}$=1,0	

Consequently we find that the total volume of fresh-water flow at Mayport dur the ebb and flood flow as gauged was 227.6 million cubic feet.

From Table No. 13 we obtain—

	Cubic fe
Volume of ebb discharge at Mayport	1,493,800,0
Volume of flood discharge at Mayport	1,245,000,0
Difference	248,800,0
As against fresh-water flow as gauged	227,600,0

That is, the discrepancy in the two results found for fresh-water flow amounts about 9 per cent of the same, and to less than 2 per cent of the entire ebb volume.

A second method of checking offers study by comparison with the tidal prism. Th volume of this has already been computed in my report to you of June 30, 1892, b the tidal data available at the time were, as was stated, not sufficiently exhaust to insure the desirable degree of exactitude of the result which now appears poss ble. In connection with this subject it may be well to briefly refer once more to th peculiar features of the St. Johns tidal prism.

At the time the ebb current commences to run at Mayport it is about high wat at Jacksonville and low water at Palatka, and at the time the ebb current ceases t run at Mayport it is about low water at Jacksonville and high water at Palatk About half way between these two places, somewhere near San Patricio, probab the two lines showing river's surface at beginning and end of Mayport ebb curre therefore cross each other, as shown on Sheet No. 2. In other words the tidal pri voided during a Mayport ebb tide does not extend to the head of tide but only t point about 60 miles below it. Above that point (San Patricio) the water does n *fall*, but it rises during such ebb tide, that is the prism above San Patricio is *not voided* but is filled. During a flood tide at Mayport the same prism is, of course, *voided* and *not filled*.

From the diagram of surface slopes at time of change of current at Mayport, given on Sheet No. 2, we obtain the heights of the tidal prism, and from them, in connection with the surface areas, we find the volumes as follows:

Tidal prism of St. Johns River.

1. PRISM VOIDED DURING MAYPORT EBB FLOW.

Locality.		Area.	Height.	Volume.	Total volume.
From—	To—				
		Square feet.	*Feet.*	*Cubic feet.*	*Cubic feet.*
Mayport	Fulton	110,000,000	1.39	152,900,000	
Fulton	Dames Point	225,000,000	1.45	236,200,000	
Dames Point	Jacksonville	405,000,000	1.12	453,600,000	
Jacksonville	San Patricio	2,035,000,000	0.42	854,700,000	
Total volume of prism voided during Mayport ebb flow					1,787,400,000

2. PRISM FILLED DURING MAYPORT EBB FLOW.

San Patricio	Palatka	983,000,000	0.34	334,200,000	
Palatka	Welaka	184,000,000	0.56	103,400,000	
Welaka	Head tide	70,000,000	0.22	15,400,000	
Total volume of prism filled during Mayport ebb flow					453,000,000
Consequently prism voided through Mayport cross section					1,334,400,000
For the flood we have in a similar way:					
Prism filled through Mayport cross section and by fresh-water flow					1,334,400,000

Our check now stands in this way:

1. EBB.

	Cubic feet.
Prism voided through Mayport cross section	1,334,400,000
Fresh-water flow during ebb as gauged	123,900,000
Consequently entire ebb discharge at Mayport	1,458,300,000
As against discharge found from Mayport gauging	1,493,800,000

2. FLOOD.

Prism filled through Mayport cross section and by fresh-water flow during flood	1,334,400,000
Fresh-water flow during flood	103,700,000
Consequently entire flood inflow at Mayport	1,230,700,000
As against flood inflow found from Mayport gauging	1,245,000,000

The discrepancy amounts to only 2½ per cent in the case of the ebb and less than half of that in the case of the flood, and we are, therefore, justified to look upon the Mayport discharge volumes rendered by Table No. 13 as well established. While these volumes correspond to mean tidal conditions, they do not correspond to mean conditions of fresh-water flow. In order to find the necessary correction it is necessary first to determine the mean duration of ebb as well as flood flow. The following table renders the time of change of current after high and low water stand as observed during gauging operations.

TABLE 16.—*Intervals between the times of high and low water stands at Mayport and* *time of change of current there as observed.*

1. AFTER HIGH WATER TO EBB.

No. of vertical.	Aug. 12.	Aug. 13.	Aug. 15.	Aug. 16.	Aug. 17.	Aug. 18.	Aug. 20.	Aug. 22.	Aug
	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	
1	1 42								
2	1 55								[illegible]
3	2 05	2 20	2 12	2 20	2 37				[illegible]
4		2 22	2 16	2 22	2 42		2 06	1 56	[illegible]
5		2 20	2 18	2 28	2 43	2 37	2 06	1 56	
6						2 37	2 03	1 56	
7						2 37			

NOTE.—Easterly winds appear to increase and westerly winds appear to diminish these interv

2. AFTER LOW WATER TO FLOOD.

No. of vertical.	Aug. 12.	Aug. 13.	Aug. 15.	Aug. 16.	Aug. 17.	Aug. 18.	Aug. 20.	Aug. 22.	Aug
1									
2	2 50								[illegible]
3	2 50	2 30	2 30	2 37	2 37				[illegible]
4		2 30	2 24	2 27	2 30			2 20	[illegible]
5		2 23	2 25	2 25	2 22	2 22		2 35	
6						2 18		2 20	
7						2 18			

NOTE.—Easterly winds appear to diminish and westerly winds appear to increase these interv

From these figures the mean time of change of current was determined by si averaging for those verticals for which numerous data were available—that i verticals 3, 4 and 5. The rest were then determined by comparison with these damental results; for instance, the ebb interval found for vertical 1 on Augu was increased to the same amount that the interval of vertical 3 observed on day was smaller than the mean, and so forth. In this way the following m were obtained:

Mean intervals between the time of high and low water stand at Mayport and the ti change of current there.

Vertical.	1. After high water to ebb.	2. A lo wat flo
	h. m.	h.
1	1 51	[illegible]
2	2 04	[illegible]
3	2 14	[illegible]
4	2 14	[illegible]
5	2 21	[illegible]
6	2 17	[illegible]
7	2 17	[illegible]

The mean intervals for the entire cross-section are now found by averaging above figures in such a way that each of them is given the weight due to it acc ing to the tidal-discharge volume of its vertical.

Computation of mean interval for the entire cross section between the times of high and water stand at Mayport and the times of change of current there.

Vertical.	1. After high water to ebb.	2. After water to flo
1	1.9×111=211	0.3×16
2	2.9×124=360	2.5×1
3	2.5×134=335	1.9×1
4	2.3×134=308	2.4×14
5	2.1×141=296	2.3×14
6	2.4×137=329	2.4×14
7	0.9×137=123	0.7×14
	15.0 1,962	12.5
Mean	$\frac{1,962}{15}$=131=2 11	$\frac{1,840}{12.5}$=147=

Consulting the lunitidal intervals of high and low water as given for Mayport in Table No. 2, we now find that on the average change of current at this place occurs as follows:

Time of change of current at Mayport after moon's transit.

	h. m.
From flood to ebb	9 49
From ebb to flood	16 28

and from this we obtain mean duration of tidal flow at Mayport:

Ebb flow, 6 hours 39 minutes=23,940 seconds.
Flood flow, 5 hours 46 minutes=20,760 seconds.

Now, between our above-found ebb and flood volume (Table No. 13) there is a difference of 248,800,000 cubic feet, which represents the fresh-water flow during the entire duration of ebb and flood. According to the duration of each there was, therefore, during the ebb a fresh-water flow of 133,200,000 cubic feet and during the flood one of 115,600,000 cubic feet. From the average volume of fresh-water flow at Mayport, as given in Table No. 7, we obtain in connection with the duration of ebb and flood flow as given above—

Fresh-water discharge at Mayport when the river is at an average state.

	Cubic feet.
During mean ebb flow	198, 200, 000
During mean flood flow	171, 800, 000

Deducting from these figures the above-given volumes of fresh-water flow as they actually existed during the time of gauging, we obtain the deficiency that prevailed at that time:

Deficiency of fresh-water flow at time of gauging work at Mayport.

	Cubic feet.
Deficiency during ebb flow	65, 000, 000
Deficiency during flood flow	56, 200, 000

On account of this discrepancy the totals of Table No. 13 therefore render the ebb volume 65,000,000 cubic feet smaller and the flood volume 56,200,000 cubic feet greater than the volumes corresponding to mean conditions of tide and of fresh water really are. They further render the ebb volume 32,000,000 cubic feet greater and the flood volume 27,800,000 cubic feet smaller than the volumes corresponding to the lowest stage of the river are, and they finally render the ebb volume 723,800,000 cubic feet smaller and the flood volume 627,400,000 cubic feet greater than the volumes corresponding to the highest stage of the river are (see Table No. 7). Introducing all these corrections, we now obtain—

TABLE 17.—*Tidal flow at Mayport under mean tidal conditions.*

Designation.	Average cross-sectional area of discharge.	Volume of discharge.		Mean velocity.
		During 12 hours and 25 minutes.	During 1 second.	
1. For an average fresh-water flow:	*Square feet.*	*Cubic feet.*	*Cubic feet.*	
Ebb	35, 900	1, 558, 800, 000	65, 110	1. 81
Flood	40, 400	1, 188, 800, 000	57, 270	1. 42
2. For smallest fresh-water flow on record (August, 1892):				
Ebb	35, 900	1. 461, 800, 000	61, 060	1. 70
Flood	40, 400	1, 272. 800, 000	61, 310	1. 52
3. For greatest fresh-water flow on record (October, 1891):				
Ebb	35, 900	2, 217, 600, 000	92. 640	2. 58
Flood	40, 400	617, 600, 000	29, 750	0. 74

Aside from the volumes corresponding to mean tidal conditions our flood gaugi enable us to form the following approximate estimate of the discharge at Mayport d ing an ordinary spring tide, that is for a high water of 5.35 and a low water of 0.

Estimated tidal flow at Mayport during an ordinary spring tide and average fresh-wa flow.

Designation.	Average cross-sectional area of discharge.	Volume of discharge.		Mea veloc
		During 12 hours 25 minutes.	During 1 second.	
	Square feet.	*Cubic feet*	*Cubic feet.*	
Ebb	35,900	2,220,000,000	92,730	2
Flood	41,000	1,850,000,000	89,110	2

From this it is readily seen that the combinations of a strong freshet, with a spr tide, may increase the ebb volume at Mayport to about 3,000,000,000 cubic feet nearly twice the amount of the discharge under mean circumstances. If in addit to this a heavy easterly wind during flood tide changes to a westerly direction dur ebb tide then the ebb volume may be still further vastly increased. Indeed, it is matter of record (observed by Mr. F. W. Bruce) that in the beginning of 1888 un such circumstances (the wind continuing southwest strong for a week or more flood current at all was noticed at Mayport for three days.

The supposition suggests itself that this extraordinary fresh-water flow may, in measure, be the cause of the excellent condition of the mouth in 1888. This su position is further corroborated when it is considered that the year 1888 appears mark the end of a series of years with average rainfall or more, while the year 1 with its less favorable conditions at the mouth was, as has been shown above, a ye with considerable less than the mean annual rainfall.

6. Comparison of present results with those of 1878.—From his gauging work the fall of 1878 Mr. Daubeney computes an ebb volume at Mayport of 1,744,000 cubic feet. The flood volume is not computed by him, but the velocity curves a submitted with his report.

Gen. Gillmore, employing a different method of computation, arrives at the fo lowing results, corresponding to mean tidal conditions:

Tidal discharge at Mayport as gauged 1878.

	Cubic fe
Ebb volume	1,860,000,
Flood volume	1,181,000,

Employing a third method, I have arrived at an ebb volume very nearly the sa as Gen. Gillmore's. The flood volume could not very well be computed in any ot way than done by him, as the data for it were very meager.

Before comparing the above two results with our present volumes it is necessary discuss, as far as possible, the conditions of fresh-water flow under which they were tained. In the following table is rendered the height of rainfall at Jacksonville each month of the year 1878 and of 1892:

Height of rainfall at Jacksonville in inches.

Month.	1878.	1892.	Month.	1878.	18
January	3.14	3.99	August	2.85	4
February	5.32	.77	September	21.12	1
March	2.37	.76	October	3.81	3
April	5.38	.11	November	1.39	
May	1.52	1.34	December	3.86	2
June	5.03	6.38			
July	4.63	3.16	Total	60.42	4

According to the Jacksonville records the year 1878 then was unquestionably wet one, but not excessively so, as the mean rainfall there is about 55 inches.

The gauging of the flood was done from October 31 to November 4. In order illustrate the conditions prevailing at that time there are given in the follow table the aggregate heights of rainfall during one, two, three, four, and five months immediately preceding the 1st of November, and there is also given the average rainfall for the same length of time:

Rainfall at Jacksonville in 1878.

	Total.	Mean.
	Inches.	*Inches.*
Oct. 1 to Oct. 31	3.81	5
Sept. 1 to Oct. 31	24.93	10
Aug. 1 to Oct. 31	27.78	15
July 1 to Oct. 31	32.41	20
June 1 to Oct. 31	37.44	25

It appears from this table that the rainfall preceding the gauging work was very much above the average, excepting during the immediately proceding thirty days. From what has been learned of the relation between the rainfall and the state of the upper river there can not be the slightest doubt that the enormous September precipitation extended its influence into the gauging period, and that the fresh-water flow then was considerably above the average, an opinion which is shared by Gen. Gillmore (Report of Chief of Engineers 1879, Vol. I, p. 781), and which is fully corroborated by the short duration of the flood flow during the period of gauging, viz, 4 hours 38 minutes on the average as against a mean duration of 5 hours 46 minutes. That means that the flood volume, as found, which corresponds in size almost exactly to the present mean volume of Table No. 17, was smaller than the volume corresponding to mean conditions; in other words, that in 1878 there was a greater flood volume than there is now.

This general result is the only one yielded by a discussion of the flood observations of 1878, and it should be added that even this does not possess the desirable degree of reliability; because the flood gauging of 1878, has been done under tidal conditions departing considerably from the mean, and besides this the field data are very meager.

It is different with the ebb gauging of 1878, to the discussion of which we now proceed. This was done in three periods, as follows: From November 5 to 8, from November 23 to 26, and from December 7 to 12. During the first two periods there was generally a considerable departure from mean tidal conditions, nearly all tides being too high. But the tides of December 7 and 8 were very close to the mean, and from them I have made the actual computations of volumes, employing the other days only to compute ratios between the various verticals. In the following the computation is briefly outlined:

The average of the tides of December 7 and 8 is so close an approximation to the mean that the lengths of flow found on these days were accepted as correct. The verticals gauged were 2, 3, 4, and 5. From these the lengths of flow on the other days were computed by means of the table of ratios given on page 776, Vol. I, Report of Chief of Engineers for 1879, and these bids were multiplied by the areas of compartments as given on page 790 ibid. The results are rendered in the following table:

TABLE 18.—*Computation of mean ebb volumes from the Mayport gauging of 1878.*

Number of compartment.	Length of flow.	Area of compartment.	Volume of discharge.	Remarks.
	Feet.	*Square feet.*	*Cubic feet.*	
Shore	24,500	1,040	25,500,000	Computed by ratio from verticals 2, 3, 4, and 5.
1	49,000	1,715	84,000,000	
2	59,500	4,920	292,700,000	As gauged on Dec. 7. H. w., 3.7; l. w., —0.4.
3	70,000	4,570	319,900,000	
4	60,600	4,360	264,200,000	As gauged on Dec. 8. H. w., 4.5; l. w., 0.0.
5	64,400	4,580	295,000,000	
6	49,700	5,180	257,400,000	Computed by ratio from verticals 2, 3, 4, and 5.
7	46,100	6,280	289,500,000	
8	32,700	1,705	55,800,000	
Shore	16,300	585	9,400,000	
Total	....	....	1,893,400,000	

The total volume agrees so closely with the volume given by Gen. Gillmore in h report and computed in an entirely different way that good evidence is there furnished of its substantial correctness. The present method of computation, how ever, has this distinct advantage, that only the conditions prevailing on Decemb 7 and 8 enter into the result, the work of all other days having been employ merely to establish ratios between the individual verticals. The conditions of fre water flow prevailing at this time are illustrated by the following table, which giv the aggregate heights of rainfall at Jacksonville for one, two, three, four, five, and s months previous to it. By way of comparison the same table also gives the aggre gate heights of rainfall for the same periods previous to October 31, 1892:

Rainfall in 1878.		*Rainfall in 1892.*	
Nov. 1 to Nov. 30	1.39	Oct. 1 to Oct. 31	3.
Oct. 1 to Nov. 30	5.20	Sept. 1 to Oct. 31	17.
Sept. 1 to Nov. 30	26.32	Aug. 1 to Oct. 31	22.
Aug. 1 to Nov. 30	29.17	July 1 to Oct. 31	25.3
July 1 to Nov. 30	33.80	June 1 to Oct 31	31.7
June 1 to Nov. 30	38.83	May 1 to Oct. 31	33.

We perceive from this table that during the two months immediately precedi the two periods there was a much heavier rainfall in 1892 than in 1878. During t longer periods of three, four, five, and six months there was a preponderance of ra fall in 1878, but not a very marked one. The conclusion is, therefore, justified th the much greater precipitation during the sixty days immediately preceding t 31st of October, 1892, has caused on this day a stronger fresh-water flow in the S Johns than existed in the beginning of December, 1878.

Now on October 31, 1892, the fresh-water flow at Volusia during 12 hours 25 m utes was 181,000,000 cubic feet according to Table No. 5. Applying our ratio of 8 to 3,000 we find that it was 489,000,000 cubic feet at Mayport, that is, about 120,0 000 cubic feet more than the mean. The above discussion therefore leads to the r sult that the fresh-water flow at Mayport during the December gauging period 1878 can not have exceeded the average flow by more than 120,000,000 cubic feet 12 hours 25 minutes.

That at this time a very marked subsiding of the September freshet had tak place becomes apparent also from a comparison of the average durations of ebb ti during the three gauging periods, which were as follows:

Average duration of ebb flow as gauged, 1878.

	h
From November 5 to 8	7
From November 23 to 26	7
From December 7 to 12	6

When it is considered that the mean duration of ebb flow is 6 hours 39 minu it becomes evident that since the beginning of November the river had steadily be declining towards mean conditions, and although they had not been actually reach at the beginning of December, still the approach to them was close.

Assuming now, in accordance with the above, the greatest possible excess of fre water flow as entering into the ebb volumes of 1878, viz, 120,000,000 cubic feet twelve hours twenty-five minutes, then we find that about 68,000,000 cubic feet this pertains to the ebb and that its gauged volume has to be reduced by this amo to obtain the volume corresponding to the mean conditions. This operation rend the following results:

Volume of ebb flow at Mayport in 1878 corresponding to mean conditions of tide and fresh-water flow.

	Cubic f
According to Gen. Gillmore's computation	1,792,000,
According to George Daubney's computation	1,676,000,
According to E. A. Gieseler's computation	1,825,000,

In all three cases we find a considerably greater volume than the present me volume, the falling off respectively amounting to 15, 7½, and 17 per cent of the pr ent mean volume. When it is further considered that Mr. Daubney's volume undoubtedly been computed too small, then it seems hard to escape the definite c clusion that since 1878 there has been a decline in the tidal flow of the St. Joh River of probably between 10 and 15 per cent. The final deductions arrived at my report of June 30, 1892, as to the danger of further contraction of the entra are, therefore, corroborated and the following points must be recognized as fundamental for the further progress of the work of improvement:

1. Entire discontinuance, at least for the present and probably in all future, of work on the north jetty.

2. The south jetty to be continued in this way, that first a sill course is to be constructed across the shoal to deep water and that then this sill course is gradually heightened throughout its entire length, no further heightening of the jetty being done at any other point except in conformity with this plan. The height required for the creation and the maintenance of a channel along the south jetty will then become apparent as the work progresses and it will be possible to avoid building higher than is required and thus to obstruct the entrance more than is necessary.

According to present indications, it seems probable that the construction of little more than the sill course across the shoals will be followed by a practicable channel along it. How much more will be required to maintain it against such combinations of unfavorable circumstances as will occur from time to time, future experience only can demonstrate. Everything, however, seems to point to the probability that it will not be required to carry the outer portions of the jetty as high as low-water level.

The following volumes have been computed from the tidal prism for points above Mayport:

Tidal flow at points above Mayport under mean conditions of tide and of fresh-water flow.

	Cubic feet.
1. Ebb volumes:	
At Fulton	1,280,000,000
At Dames Point	1,190,000,000
At Jacksonville	1,150,000,000
2. Flood volumes:	
At Fulton	910,000,000
At Dames Point	820,000,000
At Jacksonville	780,000,000

Appended to this is a table giving cross-sectional areas, widths, and depths from Reddies Point down to Mayport, as derived from the two surveys of 1889 and 1892. In another appended table the volumes of ebb discharge and mean ebb velocities at each of the cross sections of the first table are given, thus showing the conditions of ebb flow from somewhat below Jacksonville to Mayport.

The cross-sectional areas given in the first of these two tables in a measure explain the cause of the rapid decline of the tidal range. From Mayport to Mill Cove Point there extends a gorge, the cross sections of which range in size from about 32,000 to about 45,000 square feet, while between Mill Cove Point and Jacksonville they average probably twice as much and above Jacksonville still more. If an opening of this gorge and a systematic regulation of the river in this region is not to be thought of on account of the very great expense involved, then the future channel improvements below Dames Point will have to adopt similar measures as those that are being carried out at that point now. It is evident, though, that all such works of improvement should be planned with a careful consideration not to further obstruct this stretch of the river, which now already is insufficient in size to allow an untrammeled movement of the tidal wave. If it is found feasible to combine with the immediate object of channel improvement an increase in the size of the river bed at its most cramped portions, notably above Mayport (sections 76, 77, 78) and at and above Great Marsh Island (sections 68, 69), good results are likely to follow.

The following is a list of diagrams and appendixes submitted with this report:

1. *Sheet No. 1.*—Semimenstrual inequality of tide at Mayport.
2. *Sheet No. 2.*—Lines of high and low water and contours of tidal prism, St. Johns River.
3. *Sheet No. 3.*—Mean tidal curves on St. Johns River, Florida.
4. *Sheet No. 4.*—Probable surface slopes of St. Johns River during Mayport ebb and flood current.
5. *Sheet No. 5.*—Gauge readings taken in St. Johns River, August to October, 1892, and curve of fresh-water discharge at Volusia.
6. *Sheet No 6.*—Gauged Mayport cross sections.
7. *Sheet No. 7.*—Sketch of St. Johns River from Jacksonville to mouth, showing location of cross sections and tide gauges.
8. Table of physical elements of St. Johns River from Reddies Point to Mayport.
9. Mean ebb discharge and current in St. Johns River from Reddies Point to Mayport.

Besides these there are submitted for inspection the following diagrams employed in computing the results reported upon:

Five sheets concerning the reduction of pole-float velocity to true mean velocity.

Four sheets concerning the gauging of the fresh-water flow of the St. Johns River.

Nine sheets pole-float velocity curves.

Four sheets Mayport tidal curves.

Submitting the above, I am, major,

Very respectfully, your obedient servant,

E. A. Gieseler,
Assistant Engineer.

Maj. J. C. Mallery,
Corps of Engineers, U. S. A.

Physical elements of the St. Johns River from Reddies Point to Mayport.

[Cross sections 28 to 67 are from the survey of 1889 and cross sections 68 to 79 are from the survey of 1892.]

No. of cross section.	At mean low water.				Locality.
	Width.	Area.	Mean depth.	Channel depth.	
	Feet.	*Sq. feet.*	*Feet.*	*Feet.*	
28	4,220	63,400	15.0	28.9	Reddies Point.
29	4,750	65,300	13.8	29.0	
30	5,100	65,500	12.8	26.5	
31	6,175	74,650	12.1	28.0	Drummonds Creek.
32	8,125	95,500	11.8	32.0	Drummonds Point.
33	10,275	113,200	11.0	30.0	Cedar Creek.
34	10,900	105,100	9.7	26.5	
35	11,250	91,100	8.1	27.0	Dunns Creek.
36	10,800	90,300	8.4	25.0	
37	10,175	69,450	6.8	22.0	
38	9,750	68,900	7.1	33.5	
39	9,350	62,650	6.7	35.5	
40	9,125	71,300	7.9	33.5	Newcastle Island.
41	8,200	71,000	8.7	27.0	Pauline Island.
42	6,375	68,900	10.8	13.5	
43	5,900	61,900	10.5	15.0	
44	6,100	63,250	10.4	16.5	Dames Point.
45	8,200	61,000	7.4	19.0	Mill Cove.
46	7,275	49,150	6.8	18.0	Do.
47	6,700	46,800	7.0	20.5	Radcliffe Island
48	5,530	45,650	8.2	12.5	Do.
49	4,800	44,800	9.3	15.5	
50	4,325	44,450	10.3	26.3	Yellow Bluff.
51	4,475	45,250	10.1	20.0	
52	4,700	50,500	10.7	18.8	Mill Cove Point.
53	5,025	47,350	9.4	21.0	Do.
54	5,050	53,800	10.7	15.0	
55	4,350	43,000	9.9	34.0	
56	4,325	36,900	8.5	29.0	Long Island.
57	4,175	38,250	9.2	25.0	Do.
58	4,025	40,600	10.1	23.5	
59	3,850	38,700	10.1	23.5	Clapboard Creek.
60	3,600	45,150	12.5	24.0	
61	3,275	43,700	13.4	20.0	
62	3,600	43,950	12.1	36.3	Fulton.
63	3,825	41,900	10.9	40.0	
64	3,100	44,700	14.4	38.0	St. Johns Bluff.
65	2,650	45,300	17.1	31.0	
66	3,300	39,850	12.1	20.0	
67	4,050	38,250	9.4	15.0	
68	4,050	34,350	8.5	25.5	
69	3.950	33,900	8.6	30.8	
70	4,750	37,200	7.8	29.0	
71	5,150	37,950	7.4	24.0	Great Marsh Island.
72	4,850	40,350	8.3	19.5	
73	4,650	38,200	8.2	16.5	
74	4,350	36,750	8.5	16.5	Mile Point.
75	3,450	37,550	10.9	25.0	
76	2,050	32,950	16.1	34.5	
77	2,200	34,600	15.7	33.0	
78	2,050	31,600	15.4	20.5	
79	1,700	34,500	20.3	23.0	Mayport.

Mean ebb discharge and current in the St. Johns River from Reddies Point to Mayport.

[Duration of ebb flow is assumed at 24,000 seconds throughout.]

No. of cross sections.	Width.	Area.	Discharge.	Discharge per second.	Mean velocity per second.	Locality.
	Feet.	*Sq. feet.*	*Cubic feet.*	*Cubic feet.*	*Feet.*	
28	4,220	65,932	1,175,000,000	48,960	0.74	Reddies Point.
29	4,750	68,525	1,176,000,000	49,000	0.72	
30	5,100	69,070	1,177,000,000	49,040	0.71	
31	6,175	78,972	1.178,000,000	49,080	0.62	Drummonds Creek.
32	8,125	101,187	1,179,000,000	49,120	0.49	Drummonds Point.
33	10,275	120,392	1,180,000,000	49,170	0.41	Cedar Creek.
34	10,900	112,730	1,180.000,000	49,170	0.44	
35	11,250	98,975	1,181,000,000	49,210	0.50	Dunns Creek,
36	10,800	97,860	1,182,000,000	49,250	0.50	
37	10,175	76,572	1,183,000,000	49,290	0.64	
38	9,750	75,725	1,185,000,000	49,370	0.65	
39	9,350	69,196	1,187,000,000	49,460	0.71	
40	9,125	78,520	1,188,000,000	49,500	0.63	Newcastle Island.
41	8,200	77,560	1,188,000,000	49.500	0.64	Pauline Island.
42	6,375	74,000	1,189,000,000	49,540	0.67	
43	5,900	66,620	1,190,000,000	49,580	0.74	
44	6,100	68,130	1,190,000,000	49,580	0.73	Dames Point.
45	8,200	67,560	1,192,000,000	49,660	0.74	Mill Cove.
46	7,275	54,970	1,195,000,000	49,790	0.91	Do.
47	6,700	52,160	1,197,000,000	49.880	0.96	Radcliffe Island.
48	5,530	50,074	1,200,000.000	50,000	1.00	Do.
49	4,800	48,640	1,203,000,000	50,120	1.03	
50	4,325	47,910	1,206,000,000	50,250	1.05	Yellow Bluff.
51	4,475	48,830	1,210,000,000	50,420	1.03	
52	4,700	54,730	1,214.000,000	50,580	0.92	Mill Cove Point.
53	5,025	51,872	1.218.000,000	50,750	0.98	Do.
54	5,050	58,345	1,221,000,000	50,880	0.87	
55	4,350	46,915	1,225,000,000	51,040	1.09	
56	4,325	40,792	1,230,000,000	51,250	1.26	Long Island.
57	4,175	42,007	1,236,000,000	51,500	1.23	Do.
58	4,025	44,222	1,243,000,000	51,790	1.17	
59	3,850	42,165	1,250,000,000	52,080	1.24	Clapboard Creek.
60	3,600	48,390	1,259,000,000	52,460	1.08	
61	3,275	46,647	1,268,000,000	52,830	1.13	
62	3,600	47,190	1,278,000,000	53,250	1.13	Fulton.
63	3,825	45,342	1,289,000,000	53,710	1.18	
64	3,100	47,800	1,300,000,000	54,170	1.13	St. Johns Bluff.
65	2,650	47,950	1,312,000,000	54,670	1.14	
66	3,300	43,150	1,325,000,000	55,210	1.28	
67	4,050	42,300	1.338,000,000	55,750	1.32	
68	4,050	38,400	1,350,000,000	56,250	1.46	
69	3,950	37,850	1,365,000,000	56,880	1.50	
70	4,750	41,950	1,380,000,000	57,500	1.37	Great Marsh Island,
71	5,150	43,100	1,396,000,000	58,170	1.35	Do.
72	4,850	45,200	1,412,000,000	58,830	1.30	Do.
73	4,650	42,850	1,430,000,000	59,580	1.39	
74	4,350	41,535	1,443,000,000	60,130	1.45	Mile Point.
75	3,450	41,345	1,468,000,000	61,170	1.48	
76	2,050	35,205	1,488,000,000	62,000	1.76	
77	2,200	37,020	1,506,000,000	62,750	1.70	
78	2,050	33,855	1,524,000,000	63,500	1.88	
79	1,700	36,370	1,545,000,000	64,380	1.77	Mayport.

COMMERCIAL STATISTICS.

Commerce of St. Johns River, Fla., for the year ending December 31, 1892.

[Furnished by Charles H. Smith, secretary board of trade, Jacksonville, Fla.]

Articles.	Gross tonnage.	Estimated value.	Articles.	Gross tonnage.	Estimated value.
Bananas	450	$12,000	Naval stores	1,224	$32,573
Cotton (Sea Island)	1,215	485,936	Oranges	22,028	770,980
Coal	60,000	240,000	Phosphate	850	4,280
Cement	1,125	30,000	Pine apples	48	4,000
Fertilizers	16,420	574,700	Railroad ties	17,869	59,562
Fish and oysters	53	1,500	Shingles	20,000	175,000
Fruits	3,376	84,652	Tobacco	503	502,500
Hides	120	16,800	Vegetables	552	13,823
Lumber, logs	225,000	210,000	Watermelons	29	750
Lumber, sawed	156,105	749,306			
Merchandise	200,000	10,000,000	Total	726,967	13,968,362

Vessels.	Character.	No.	Average tonnage.	Averag draft.
Steamers	Merchant	359	1,895.75	[illegible]
Sailing	do	328	258.61	[illegible]

Number of passengers carried, 15,600.
Amount received for fares, $280,800.
Estimated percentage of total trade of neighborhood carried by water, 25 per cent
Probable increase of trade were the improvement completed, 300 per cent.

O 2.

IMPROVEMENT OF UPPER ST. JOHNS RIVER, FLORIDA.

By the river and harbor act approved July 5, 1884, the sum of $5,0 was appropriated for improving the Upper St. Johns River, Florid. This is the only appropriation ever made by Congress for this work.

The part of the St. Johns River referred to in the act is presumed be that portion extending from Lake Monroe to the head of La George, a distance by river of about 45 miles. An examination of th section was made in the early part of the year 1879, report of whic dated July 16, 1879, with a project of improvement, is printed as Ap pendix I 9, Annual Report of the Chief of Engineers for 1879. It w stated in that report that the stream, although very crooked, is ample depth for any class of vessels adapted to the navigation of t Upper St. Johns River, and that the only gain to be secured by c offs is strictly in distance. It was suggested to confine the work improvement to cutting off the four most prominent bends, located a follows:

1. A bend three-fourths of a mile above Old Town, 25 miles bel Lake Monroe.
2. Two bends about 2 miles below Manuels Landing, 7½ miles bel Lake Monroe.
3. A bend at Manuels Landing, 5½ miles below Lake Monroe. T results of a later examination of the same section of the river, made conformity to a provision in the river and harbor act passed August 1892, did not differ from the conclusions previously reached.

Pursuant to instructions from the Department, another report w submitted October 5, 1883, with revised plans and estimates.

The width of the river at the bends named varies from 130 to 1 feet, and in the reaches connecting them from 150 to 200 feet. T banks and adjoining ground average 4 feet above water surface at l river stage. The plan of improvement contemplates cut-offs 100 f wide at the bottom, side slopes 1 on 1, and a low river depth in the c of 6 feet. This depth was adopted as being the maximum low-ri depth at the shoalest places between Little Lake George, 20 miles b the head of Lakes George and Lake Monroe.

Two estimates were submitted, one for straight cut-offs and the ot for curved cut-offs, with quite easy curves, so as to offer no obstruc to navigation. The work would principally consist of dredging, b few light closure dams would have to be built and some grubbing d The estimated cost of this improvement is $43,000 for straight cut- and $38,000 for curved cut-offs. The latter system has been adop

The appropriation available being small, it was proposed to begin operations by opening the shortest cut—that at Old Town. Proposals for this work were invited to be opened October 24, 1884. No bids were received.

Under these circumstances, with the approval of the Chief of Engineers, it was decided to await further appropriations before beginning the work.

This part of the river is passed over by steamboats about twelve times per day.

On April 2, 1892, the original project was modified so that the money available might be expended in removing the worst points at the bends mentioned in the original project instead of opening the cut through the bend at Old Town.

OPERATIONS FOR FISCAL YEAR ENDING JUNE 30, 1893.

A contract for this work was entered into with Messrs. Marzyck and Browne on December 30, 1892, and approved February 2, 1893. The work was to be done in connection with the work of improving Volusia Bar, Florida, at the price of 36 cents per cubic yard measured in place.

Work under this contract began March 16, 1893.

There is no dredging plant available for doing small quantities of work in comparatively isolated places on the east coast of Florida, and the small amount of work in prospect would not warrant a private party in building a suitable dredge, especially in view of the uncertainty of procuring the contracts. In this instance, the contractor's plant has proven inadequate for the work and the progress is very slow. Up to the end of the fiscal year 2,006.7 cubic yards of material have been removed from two of the worst points at the upper bends referred to in the project locally known as Wekiva Bend and Coxetter's Bend.

I would invite attention to the recommendation of my predecessor, Capt. W. M. Black, Corps of Engineers, that a properly equipped dredge and snag boat be built by the United States for operations on the rivers and harbors of the east coast of Florida. Such a boat would be available for maintaining the improvements now in progress in the lower St. Johns River, at Volusia Bar, the Upper St. Johns River, and the Ocklawaha River, and could be built at a cost of $20,000.

This work is in the collection district of St. John's. Jacksonville is the nearest port of entry. Nearest light-house is Volusia Bar Light. Nearest fort is Fort Marion, Florida.

Money statement.

uly 1, 1892, balance unexpended		$4,930.05
une 30, 1893, amount expended during fiscal year		385.25
uly 1, 1893, balance unexpended		4,544.80
uly 1, 1893, outstanding liabilities	$822.27	
uly 1, 1893, amount covered by uncompleted contracts	3,377.73	
		4,200.00
uly 1, 1893, balance available		344.80
Amount (estimated) required for completion of existing project		33,800.00
Amount that can be profitably expended in fiscal year ending June 30, 1895		33,800.00

Submitted in compliance with requirements of section 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

(For abstract of proposals, and commercial statistics, see report "Im-oving Volusia Bar, Florida.")

O 3.

IMPROVEMENT OF VOLUSIA BAR, FLORIDA.

Volusia Bar is located at the south end or head of Lake George, abo 162 miles by river from the mouth of St. Johns River, at the po where the waters of the river flow into the lake.

An examination of Volusia Bar with a view to its improvement w made in March, 1879. A report thereon, dated July 16, 1879, wi a plan of improvement, is printed as Appendix I 9, Annual Report the Chief of Engineers for 1879.

This was modified as reported in the Annual Reports of the Chief Engineers for 1882 and 1883, Appendixes J 11 and L 14, respectively.

Before its improvement the channel over the bar was very crook and had a least depth varying from 3½ to 4½ feet.

APPROVED PROJECT.

To establish and maintain a channel 6 feet deep across the bar the increased velocity of flow produced by two converging jetties brush and stone, assisted by dredging, if necessary, and to define a protect the channel thus formed by rows of fender piles.

In 1887 this project was modified to limit the depth to the 5 f already attained, as that depth is sufficient for the steamers navigat the Upper St. Johns River, and is as great as can be carried over t bars between Lake Monroe and Lake George.

Operations for improving Volusia Bar, Florida, have been carried at intervals since December, 1880, under the following appropriatio

By act approved—	
June 14, 1880	$5
March 3, 1881	5
By act passed August 2, 1882	5.
By act approved—	
July 5, 1884	2
August 5, 1886	7
By act of August 11, 1888	[illegible]
By act approved—	
September 19, 1890	[illegible]
July 13, 1892	1
Total	27,

OPERATIONS PRIOR TO JUNE 30, 1892.

The total amount expended up to June 30, 1892, including liabili then outstanding, was $25,889.91. Two jetties had been built, start from opposite sides of the river bank at the south edge of the lake a converging until on the bar the clear channel way between them was feet wide. The east jetty is 3,400 feet long, and is built to the level mean low water for 2,930 feet from the shore. The west jetty is 2 feet long, of which a length of 1,940 has its crest at the level of m low water. Two rows of firmly set piles provided with waling s confine boats to a 100-foot channel across the crest of the bar. In 1 the depth attained was reported to be ample for the existing commer

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 189

By the act approved July 13, 1892, $1,000 was appropriated for t maintenance of the work. Contract was entered into with Mess arzyck & Browne, of Jacksonville, Fla., for repairing the rows of ender piles and dredging the bar. The fender piles have been repaired, ut up to the close of the fiscal year dredging had not been begun.

WORK REQUIRED.

The St. Johns River, above Lake George, is a silt-bearing stream, ving eroding banks, pools, and shoals, and is subject to marked uctuations of level. Lake George forms a settling-basin and receives annual deposit from the materials eroded between lakes George and onroe, a distance of 45 miles. The greater portion of this material is posited at the head of the lake, where the river currents lose velocity entering the broader expanse, and there forms and maintains Volu-a Bar. It is evident that any increase of depth produced by con-action and scour in a bar of this character will simply push the deposit rther out into the still water. If the depth of the lake where the ew deposit is formed were great, the improvement of the channel by nassisted jetties might have some permanence.

Lake George is very shoal. In 1887 the least channel depth was ported to be 5 feet; 6, 7, and 8 foot contours of the bottom were 420, 80, and 1,440 feet, respectively, from the ends of the jetties, and a dis-ance of 3,400 feet beyond the jetties a maximum depth of 9.6 feet only as found. In 1891 the least channel depth was 4.6 feet and the 6, 7, and foot contours 375, 480 and 1,175 feet, respectively, from the ends of he jetties.

Commerce has been greatly hampered by boats grounding on the ar. Further improvement of the bar is required. Only temporary elief can be obtained by an extension of the jetties. The best and urest method to adopt will be to deepen the channel by dredging from ime to time as may be needed.

From past experience it would seem that the annual deposit on the bar about 500 cubic yards. If there were any plant available this could e removed with an annual expenditure of $500.

This work is in the collection district of St. Johns. Jacksonville is the nearest ort of entry. Nearest light-house is Volusia Bar Light. Nearest fort is Fort arion.

Money statement.

ly 1, 1892, balance unexpended		$110.09
mount appropriated by act approved July 13, 1892		1,000.00
		1,110.09
ne 30, 1893, amount expended during fiscal yea.		47.63
ly 1, 1893, balance unexpended		1,062.46
ly 1, 1893, outstanding liabilities	$249,84	
ly 1, 1893, amount covered by uncompleted contracts	675.00	
		924.84
ly 1, 1893, balance available		137.62
Amount (estimated) required for maintenance of existing project		1,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895		1,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of proposals for furnishing labor and material for repairing the row of fend piles at Volusia Bar and for dredging in Upper St. Johns River and at Volusia B Florida, received in response to advertisement, and opened November 19, 1898, by J. Mallery, Major, Corps of Engineers.

No.	Name of bidder.	Dredging.		Repairi fende piling
		Upper St. Johns.	Volusia Bar.	
		Cents.	*Cents.*	
1	Geo. A. De Cottes	49¾	49¾	$34
2	Marsyck & Browne	36	36	25
3	J. A. Bryan	47	43	14

The amount available for work is as follows:

For dredging in Upper St. Johns River	$4, 100.
For dredging at Volusia Bar and for repairing fender piles at Volusia Bar	900.
Total	5, 000.

Recommended that bid No. 2 be accepted.

COMMERCIAL STATISTICS.

Commerce of Upper St. Johns River, Florida, for the year ending December 31, 18

[Furnished by J. A. Leslie, Superintendent Clyde Steamship Line.]

Articles.	Gross Tonnage.	Estima value.
Fertilizers	2, 037	$6
Fruits	5, 891	14
Grain	1, 612	51
Hay	341	6
Merchandise	4, 964	49
Vegetables	473	11
Total	15, 318	78

Vessels.	Character.	Tonnage.	Draft.
		Tons.	
City of Jacksonville	Side-wheel steamer	460	4 feet light.
F. De Bary	do	300	Do.
Everglade	do	430	Do.
Welaka	Stern-wheel steamer	300	2½ feet ligh

Number of passengers carried by steamers, 10,000.

O 4.

IMPROVEMENT OF OCKLAWAHA RIVER, FLORIDA.

The Ocklawaha River has its source in Lake Apopka, central Florida, ws slightly west of north for about 104 miles, measured along the is of the channel, then almost due east for 21 miles farther, when it ites with the St. Johns River. The Ocklawaha River is the princi- l outlet of a number of large lakes, whose aggregate area is about 5 square miles.

The only important tributary of the Ocklawaha River is the Silver rings Run, which is 6 miles long and has an average width of about feet and a least depth along the axis of the channel of about 9 feet. ing the outlet of the famous Silver Spring, its volume of discharge ries but little.

From Lake Griffin down for a distance of about 28 miles the river ws through a wide savanna submerged about 1 foot under water d covered with a dense growth of saw grass. On this reach the ver averages from 30 to 40 feet in width and has a least channel depth f about 5 feet; the current is very sluggish.

The impediments to navigation on this portion of the river are the umerous bends, the narrow channel, floating islands, and eel grass.

From the savanna to the mouth, a distance of about 58 miles, the anks are covered with a dense growth of cypress and other timber.

On this reach the river averages from 60 to 70 feet in width, and the ast channel depth is 4 feet. The average velocity of the current is onsiderably greater than on the upper river, being about 1.3 feet per cond.

The principal obstructions to navigation are snags and overhanging ees.

OPERATIONS PRIOR TO JUNE 30, 1892.

By act of Congress approved September 19, 1890, an appropriation $10,000 was made for the "improvement of Ocklawaha River, Flor- a, to Leesburg, on Lake Griffin." The project was carried out as far the prairie by the removal of 3,881 snags and 705 overhanging trees, addition to which 84 trees were trimmed.

OPERATIONS DURING FISCAL YEAR ENDING JUNE 30, 1893.

By the act approved July 13, 1892, $1,000 was appropriated for main- ining the improvement of Ocklawaha River. On July 25, 1892, a oject was submitted for continuing the improvement by the removal snags by hired labor. This project being approved August 2, 1892, ork was resumed by the United States snag boat *Shepard* in Septem- r, 1892, and suspended in October, 1892, owing to the exhaustion of nds. Five hundred and seventy-four snags and 312 overhanging trees re removed and 14 trees were trimmed, making a total to date of 455 snags and 1,017 overhanging trees removed and 98 trees trimmed.

The result has been to render the river fairly navigable as far as the airie. Above that point there are a few shoals and the floating lands. The oranges and vegetables are usually shipped when the ater is at its low stage, and the shoals form serious obstructions. It believed that the channel can not be kept clear of the floating lands unless a row of piles connected by a waling strip be constructed on each side. In view of the fact that the railroads are practically ina cessible to a large number of the residents of this portion of the riv and that the improvement of the river as far as Leesburg would enab the orange and vegetable growers in the vicinity of Lake Griffin to sh their produce by water to the St. Johns River, a project for continui the improvement to Lake Griffin was submitted and approved Octo 14, 1892, increasing the estimated cost of the improvement $15,0 making the total cost (estimated) of the improvement $26,000, of whi amount $11,000 has been appropriated.

The Ocklawaha River is in the collection district of St. Johns. The nearest lig house is the St. Augustine Light. The nearest fort is Fort Marion, Fla.

Money statement.

July 1, 1892, balance unexpended	$1,224.
Amount appropriated by act approved July 13, 1892	1,000.
	2,224.
June 30, 1893, amount expended during fiscal year	2,222.
July 1, 1893, balance unexpended	1.
Amount (estimated) required for completion of existing project	15,000.
Amount that can be profitably expended in fiscal year ending June 30, 1895	15,000.
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

COMMERCIAL STATISTICS.

Commerce of Ocklawaha River, Florida, for the year ending December 31, 1892.

[Furnished by Mr. J. W. Lees, secretary board of trade, Leesburg, Fla., and by the agent for Ocklawaha River line of steamers, Palatka, Fla.]

Articles.	Gross tonnage.	Estimat value.
Cotton	4	$1, 0
Fertilizers	1,446	54, 7
Fish and oysters	1	
Fruits (oranges)	21,334	[illegible], 7
Grain	10,000	[illegible], 0
Hides	6	1, 1
Honey, sirup, etc	30	12, 0
Ice	3,000	[illegible], 0
Lumber (rough and sawed)	2,700	[illegible], 0
Merchandise	13,202	1,070,
Vegetables	7,252	125,
Total	58,975	2,069,

NOTE.—The above figures represent the commerce of the Ocklawaha River and that of the lakes the upper end of the river. The lake commerce would appear to be much the greater, viz., 56, tons of the total.]

The following steamers are engaged in the trade of the Ocklawaha River:

Name.	Character.	Tonnage.	Dra
		Tons.	*Fee*
Eureka	Steamer	67	
Okeehumpkee	do	65	
Astatula	do	55	
Osceola	do	60	
Wahoo	do	36	

Number of passengers carried during the year, 6,400.

'he following steamers are engaged in the navigation of lakes Griffin, Harris, stis, and Dora:

Name.	Character.	Tonnage.	Draft.
		Tons.	*Feet.*
elle	Steamer	16	2
. Lane	do	30	2
n Denham	do	32	2

ollowing is an extract from a letter received from Mr. J. W. Lees, secretary of the sburg board of trade:

* * * * * * *

wrote Rev. J. F. Richmond, of Richmond, Fla., requesting him to send me reli- information as to the amount, in tons, and value of the annual output of the kao- plant of which he is president; also the prospective output of the adjoining plant in course of construction. He immediately answered stating the annual output heir plant as being 3,000 tons; value of same at plant $20,000, and at the North- potteries $40,000. The adjoining plant will have just double the capacity, or 0 tons. The prices named, he stated, are very low, in order to introduce a home duction. The quality, he says, is superior to any of the imported kaolin, and uld bring a much higher price.

understand, upon what is considered reliable authority, that a third company is ing formed for the purpose of establishing a kaolin plant, the lands having already en purchased.

* * * * * * *

O 5.

IMPROVEMENT OF ST. AUGUSTINE HARBOR, FLORIDA.

St. Augustine Harbor lies on the east coast of Florida, about 47 miles ath of the St. Johns River. It is formed by the junction of two ers, or rather salt-water lagoons, the Matanzas and Tolomato rivers, ich run parallel to the coast and there unite to break through the e of sand hills into the sea. The total length of the Tolomato River about 20 miles, and of that part of the Matanzas which receives and charges across the St. Augustine Bar, 12 miles. The San Sebastian ver, another lagoon, almost surrounds St. Augustine, and opens into Matanzas River about 3 miles from its mouth. These lagoons vary depth from 20 to 30 feet for several miles from the mouth and in dth 300 to 500 yards. They form large tidal basins, filled and emptied ough the channels across the bar. The rise of tide at St. Augustine ies from 4 to 6 feet, and the currents generated have maintained two more channels across the bar, with a least depth of from 6 to 9 feet low water. The positions of these channels are continually shift- between the south end of the mainland east of the Tolomato River orth Beach or North Point) and the cape on Anastasia Island, 2¾ es to the south. The harbor forms an excellent sheltered anchorage, t the shifting nature of the bar and the shallow water on its crest ve presented so many difficulties to mariners that the commerce of port has been greatly hampered. It is limited practically to the cessary supplies for St. Augustine.

The following appropriations have been made for this harbor:

of August 11, 1888	$35,000
approved—	
September 19, 1890	20,000
July 13, 1892	10,000
Total	65,000

PROJECT.

The approved project is to protect the shores from erosion by the construction of groins of concrete and riprap on brush-foundation mattresses.

OPERATIONS PRIOR TO JUNE 30, 1892.

With the appropriation of $35,000, made in the act of 1888 thre groins were built: No. 1, on Anastasia Island, near the northern boundar of the United States light-house reservation; No. 2, on North Beach, a the point; No. 3, on North Beach, about 2,000 feet from the point.

These groins all consist, essentially, of a foundation of brush fascine covered with riprap and capped with concrete blocks which are 2 fee wide on top and have side slopes of 1 on 2. (For detailed descripti of dimensions and methods, see Appendix P 3, Report of the chief o Engineers, 1890.)

With the appropriation of $20,000, made in the act of September 19, 1890, Groin No. 2 was extended seaward, and two new groins were built: No. 4, on Anastasia Island, about 2,200 feet northwest of Groin No. 1; and No. 5, on North Beach, between Groin No. 2 and Groin No. (For detailed description of dimensions and methods, see Appendix 4, Report of the Chief of Engineers, 1891.)

The construction of a sheet-pile wing dam was begun in January an continued at intervals until May, 1892.

This dam is 327 feet long and is built near the ordinary high-wat mark at the side of the groin and extends along the beach toward th south. It is constructed of a double row of sheet piles well brace from the rear. The back is filled in with mud and sand, and the fro is protected with fascines, staked in place and weighted with roc The desired result was produced and the sand collected in front of t wing dam.

OPERATIONS DURING FISCAL YEAR ENDING JUNE 30, 1893.

The act of July 13, 1892, appropriated $10,000 for the completion the existing project. So many changes had taken place that it was d cided to make a resurvey upon which to base the project for the expen ture of this appropriation. From the information thus obtained it w proposed to expend the amount available in constructing two n groins, located one (No. 6) between No. 1 and No. 4, and one (No. 1,700 feet east of No. 1. These two groins being deemed insufficient complete the contemplated improvement, a revised estimate of cost w submitted on February 27, 1893. Changes in the sand shoal oppos Anastasia Island have caused the channel to impinge strongly on t island, producing considerable erosion. To secure the shore, two m groins, making nine in all, will be required, together with suitable wi walls on all the groins and beach revetments at a few places on the i and. This additional work is estimated to cost $30,000, making t total cost (estimated) of the improvement $95,000.

Under contract with I. H. Hathaway & Co., of Philadelphia, Pa., t work of furnishing stone for Groins Nos. 6 and 7 is now in progr The foundations and riprap superstructures of Groins Nos. 6 and 7 ha been practically completed, and they are now ready for the concr coping. Five thousand five hundred and sixty-five linear feet of 9-i brush fascines and 1,200 tons (2,000 pounds) of stone have been pla

Photo-Lith. by A. HOEN & CO., Balto., Md.

Groin No. 6, and 1,680 linear feet of fascines and 455 tons of stone in roin No. 7.

St. Augustine is in the collection district of St. Augustine, which is the nearest rt of entry. The nearest fort is Fort Marion. The St. Augustine light is the arest light-house.

A map of the bar and vicinity accompanies this report.

Money statement.

ly 1, 1892, balance unexpended	$1,279.60
nount appropriated by act approved July 13, 1892	10,000.00
	11,279.60
ne 30, 1893, amount expended during fiscal year	3,154.63
ly 1, 1893, balance unexpended	8,124.97
ly 1, 1893, outstanding liabilities	5,008.58
ly 1, 1893, balance available	3,116.39
mount (estimated) required for completion of existing project	30,000.00
mount that can be profitably expended in fiscal year ending June 30, 1895	30,000.00

ubmitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

stract of proposals for furnishing stone for use in connection with improving harbor t St. Augustine, Fla., received in response to circular letter and opened April 1, 893, by J. C. Mallery, Major, Corps of Engineers.

Name of bidder.	Stone on Anastasia Island.		
	Estimated quantity required.	Price per ton (2,000 pounds).	Total.
	Tons.		
Ross & Barnett	1,500	$4.00	$6,000
I. H. Hathway & Co	1,500	2.74	4,110

mount available for work April 1, 1893, $9,000.
ecommended that bid No. 2 be accepted.

COMMERCIAL STATISTICS.

ommerce of harbor at St. Augustine, Fla., for the year ending December 31, 1892.

[Furnished by Mr. Henry A. Barling, jr.]

Articles.	Gross tonnage.	Estimated value.
ilizers	100	$3,000
and oysters	400	6,500
ts (oranges and grapes)	350	10,000
n	700	21,000
	1,500	28,500
y, sirup, etc	100	5,000
ber (sawed)	2,000	12,000
handise	18,000	800,000
tables	300	12,000
Total	23,450	896,000

Commerce of harbor at St. Augustine, Fla., for the year ending December 31, 189—
Continued.

Vessels.	Tonnage.	Draft
	Tons.	*Feet.*
City of St. Augustine, steamer	720	1
Schooners (4)	350	1
Schooners (2)	80	

Estimated percentage of total trade of neighborhood carried by water, 20 pe cent.

O 6.

IMPROVEMENT OF INDIAN RIVER, FLORIDA, BETWEEN GOAT CREEK AND JUPITER INLET.

The portion of the river named has a total length of 81 miles, and throughout this portion the natural channel is interrupted by numerous shoals and bars having on them a low-water depth of from 2½ to 4 feet.

The Florida Coast Line Canal and Transportation Company, a company duly incorporated under the laws of the State of Florida, has made a number (23) of dredged cuts across the shoals through this defective reach, making a continuous navigable channel 50 feet wide and 5 feet deep at low water, extending to Jupiter Inlet. The aggregate length of the cuts made by this company is 39,500 feet. Under its charter the company "is authorized to own vessels and navigate the waterway; to levy tolls on its cuts and channels improved, and to operate telegraph and telephone lines." (Prospectus of company, January, 1890.)

The Indian River is the only highway available for the products of the fertile strip of high land which forms the east coast of Florida between Titusville and Key Biscayne Bay, a distance of 200 miles. The land on both sides of the river is unsurpassed in the State for the cultivation of vegetables and semitropical fruits. Bounded on the east by the ocean and on the west by the lowlands west of the Upper St. Johns River and of the Okeechobee region, it is cut off from the general railroad system of the State, which touches it only at Titusville and extends to Eau Gallie. During the past few years the development of this country has been very rapid. Steamers now run daily between Titusville and Melbourne throughout the year, and triweekly in summer and daily in winter between Melbourne and Jupiter Inlet. These boats are light-draft stern-wheel steamers, with gross tonnage of about 150 tons, with a capacity of from 100 to 130 passengers. Their capacity has been tried to the utmost in the past, and the indications are that they will not be able to accommodate the winter travel of the future. As the young groves of oranges and bananas and the pineapple plantations, already set out, come into bearing year by year, the commerce of the river will be greatly increased.

The approved project is to make a continuous channel 5 feet deep at low water and at least 75 feet wide in the straight reaches, with as much greater width in the turns as may be required, by widening the cuts of the canal company and making new cuts where needed and by removing some of the mangroves in the narrows. It was estimated that the work proposed would cost, approximately, $44,000.

By act approved July 13, 1892, $15,000 were appropriated for—

Improving Indian River, Florida, between Goat Creek and Jupiter Inlet: *Provided*, That no part of the money appropriated shall be expended until the Florida Coast Line Canal and Transportation Company surrenders and relinquishes to the United States all the rights and privileges which it now holds under State charter along the entire route.

Ineffectual attempts have been made throughout the year to obtain from the canal company a relinquishment of the rights and privileges which it holds under the State charter, consequently no work has been done.

Money Statement.

Amount appropriated by act of July 13, 1892	$15,000

O 7.

IMPROVEMENT OF NORTHWEST ENTRANCE, KEY WEST HARBOR, FLORIDA.

The Florida Keys consist of a chain of rock and sand islands extending southwesterly from Cape Florida for nearly 200 miles. They are connected by extensive sand flats underlaid by rock, a soft oolitic limestone, from which the sand is almost entirely formed.

This chain is a barrier for all shipping from the Atlantic to the Gulf (eastern and middle) ports, and the straits between it and the West India Islands form a passage justly dreaded by mariners. This barrier is crossed by four navigable channels, one between the Dry Tortugas, at the western extremity of the chain, and Rebecca Shoals; one east of Rebecca Shoals; the third (the Boca Grande Channel) 28 miles further east, and the fourth (the northwest channel from Key West Harbor) immediately west of Key West, 85 miles east from the Dry Tortugas. It is this easterly position, combined with the good harbor of Key West at its extremity, which gives this channel its importance. It is used by vessels en route between the Atlantic and Gulf ports which do not draw more than 10.5 feet of water, the depth now available on the bar which obstructs its northern end. An estimated average daily tonnage of 2,500 tons passes through it. In rough weather the available depth is still more reduced, and vessels of more than 8 feet draft are compelled to pass through one of the channels to the westward.

The necessity for the improvement of the northwest entrance was first brought to the notice of Congress in 1868 and an examination of the bar was ordered. This was made by Lieut. (now Major) W. R. Livermore, Corps of Engineers, under the direction of Col. J. H. Simpson, Corps of Engineers. A project was submitted for opening a dredged channel across the bar 300 feet wide, 18 feet deep at mean low water, and 9,000 feet long, at an estimated cost of $217,272.

Nothing more seems to have been done at that time.

In 1881 another examination of the harbor was ordered by Congress. This was made by Thomas L. Harrison, assistant engineer, under the direction of Capt. (now Major) A. N. Damrell, Corps of Engineers, as reported on page 1314, Report of the Chief of Engineers, 1882. Maj. Damrell submitted a project for dredging a cut 300 feet wide and 17 feet deep at mean low water, at an estimated cost of $140,000. In 1882

Congress appropriated $25,000 for work under this project. With this a cut 60 feet wide and 15 feet deep at mean low water was made across the bar in 1883, but it was soon obliterated and no useful result was obtained. In 1886 an appropriation of $2,500 was made for the examination and survey of the bar. The survey was made in the fall and winter of 1886–'87. In 1888 a further appropriation of $25,000 was made for the improvement of the harbor, subject to the recommendation of a board of engineers. A preliminary report was submitted January 31, 1889, and further data having been obtained, in November, 1889, the board submitted a final report recommending that the improvement of the entrance be begun by the immediate construction of a jetty along its northeastern side.

OPERATIONS PRIOR TO JUNE 30, 1892.

In the act approved September 19, 1890, $40,000 were appropriated for the work. Proposals were opened, after due advertisement, November 29, 1890, and a contract was made with Mr. R. G. Ross for delivering stone and constructing the jetty for $1.90 per cubic yard of stone in place. Work under the contract was to be started February 28 and finished July 28, 1891. Owing to the sickness of the contractor and other causes the quarrying of rock was not begun till May. The first stone was deposited in the jetty on June 16. At the end of the fiscal year, June 30, 1892, the condition of the jetty was reported as follows:

A total of 27,982.2 cubic yards of stone have been deposited in the jetty.

For a length of 60 feet in the vicinity of Iron Station (the site of current station No. 10, survey of 1889) the jetty has been built up to within foot of mean low water; to a point 2,190 feet inside of Iron Station i has been built up to within 2 feet of mean low water; from thence to point 3,070 feet inside of Iron Station to within 5 feet of mean lo water; and from thence to a point 4,530 feet from Iron Station to a elevation varying from 3 to 4 feet below mean low water. From thenc to a point 5,365 feet inside of Iron Station, or the inner end of the jetty, only one layer of stone, about 3 feet thick, has been placed, having depth over it at mean low water of from 6 to 8 feet.

From the Iron Station to a point 840 feet outside of the same, th jetty has been built up to within 2 feet of mean low water; from thenc to the outer end of the jetty, 1,523 feet from Iron Station, only 1 laye of stone, about 3 feet thick, has been placed, having over it a depth o from 7 to 10 feet at mean low water. The average width of the base o the jetty was 25 feet, and of the crest 10 feet.

The crest of all of the higher portions of the jetty has been lowere by the force of the waves.

OPERATIONS DURING FISCAL YEAR ENDING JUNE 30, 1893.

In the act approved July 13, 1892, $75,000 were appropriated for thi work. Proposals were opened, after due advertisement, November 1 and a contract, approved January 10, 1893, was made with Mr. R. G Ross for furnishing material and constructing the jetty for $2.58 p cubic yard for stone and $2.40 per cubic yard for quarry chips.

Work under the contract was to begin March 1 and to be complete December 1, 1893. On account of the bad weather the contractor wa much delayed in getting his plant to Key West. A new quarry wa

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opened in a favorable location and the work of depositing stone in the jetty was begun on June 1.

By June 30 2,969 cubic yards of stone had been deposited, thereby extending the foundation sill of jetty seaward 1,028 feet. The foundation sill consists of a layer of stone 50 feet wide and 3 feet thick.

PRESENT CONDITION OF THE JETTY.

The crest of the jetty has been slightly lowered throughout nearly its entire length. This is believed to be due to wave action. The depth of water over the jetty varies from 3½ feet to 11½ feet and averages 6 feet.

Apparently there has been little or no scour along the jetties at their ends and it is believed that the jetty has not settled.

The condition of the channel across the bar is about the same as was reported last year; the position and the available channel depth, viz, 12.5 feet, being practically unchanged.

Under date of September 24, 1892, authority was given for the removal of the Pinnacle Rocks, forming an obstruction in the main ship channel, at a cost of $1,000. An agreement was entered into with Mr. Bradish W. Johnson, under date of October 20, 1892, to remove the obstruction for $800.

Under various pretexts, the principal one being the generally prevailing bad weather, no work of consequence has as yet been done towards their removal. It is proposed to take such steps as will result in the early completion of this work.

The harbor at Key West is in the collection district of Key West, Fla., which is the nearest port of entry. Nearest light-house is the Northwest Passage Light. Nearest fort is Fort Taylor, Florida.

The following maps accompany this report, viz:

Map of northwest entrance.
Profile of jetties.

Money statement.

July 1, 1892, balance unexpended		$118.60
Amount appropriated by act approved July 13, 1892		75,000.00
		75,118.60
June 30, 1893, amount expended during fiscal year		7,277.74
July 1, 1893, balance unexpended		67,840.86
July 1, 1893, outstanding liabilities	$8,699.05	
July 1, 1893, amount covered by uncompleted contracts	58,139.98	
		66,839.03
July 1, 1893, balance available		1,001.83
Amount (estimated) required for completion of existing projects		385,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895		385,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstracts of proposals for furnishing labor and material for constructing dike at t northwest channel entrance to harbor of Key West, Fla., received in response to advert ment and opened November 19, 1892, by J. C. Mallery, major, Corps of Engineers.

No.	Name of bidder.	In the dike, cubic yard	
		Stone.	Quarry chip
1	S. G. Harvey	$2.85	[illegible]
2	S. S. Leonard & Co	3.15	[illegible]
3	R. G. Ross	2.58	[illegible]
4	Colin McK. Grant	3.40	[illegible]
5	I. H. Hathaway & Co	3.10	[illegible]

Amount available for work, $65,000.
Recommended that bid No. 3 be accepted.

COMMERCIAL STATISTICS.

Commerce of harbor at Key West, Fla., for the year ending December 31, 1893.

[Furnished by Mr. George Phillips, Key West, Fla.]

Articles.	Gross tonnage.	Estimat value
Fertilizers	70,004	[illegible]
Fish and oysters	2,000	[illegible]
Fruits	51	[illegible]
Grain	25,000	[illegible]
Hides	13	[illegible]
Lumber:		
Rough	4,125	[illegible]
Sawed	8,250	[illegible]
Merchandise	100,000	[illegible]
Ship stores	100	[illegible]
Vegetables	10,000	[illegible]
Pineapples, plantains, etc	9,000	[illegible]
Total	228,543	[illegible]

Vessels.	Number.	Average tonnage.	Averag draf
		Tons.	Feet.
Steamers	1,000	1,400	[illegible]
Sailing	5,000	20	[illegible]

Number of passengers carried, 45,000.

Estimated percentage of total trade of neighborhood carried by water 100 p cent.

NOTE.—The figures above are based on actual compilation from records accessi in part. The coastwise business is included and is, of course, estimated.—GEO PHILLIPS.

O 8.

IMPROVEMENT OF CALOOSAHATCHEE RIVER, FLORIDA.

The Caloosahatchee River rises in the saw-grass region west of La Okeechobee, and flows west into San Carlos Bay. Between the mou and Fort Thompson, 22 miles west of Lake Okeechobee, the river bank are generally high and the country bordering the river is covered wi a dense growth of large trees, principally pines, palmettos, and oak

East of Fort Thompson the low saw-grass region begins. The entire river valley as far down as Alva, about 20 miles by river below Fort Thompson, is more or less subject to overflow by the water coming from the Okeechobee Basin. For 21 miles from its mouth the river is broad and has a channel depth of from 6 to 20 feet, with the characteristics of an estuary. This portion of the river is obstructed by oyster bars. Great beds of snags obstructed the upper river. From Alva down the country is being settled for the culture of sugar cane, pineapples, cocoanuts, oranges, limes, and lemons. Fine cattle ranges exist along the upper river.

Fort Myers, a depot for supplies during the Seminole war, is a thriving town 17 miles from the mouth.

Under the laws of the State of Florida the Atlantic and Gulf Coast Canal and Okeechobee Land Company is engaged in draining the Okeechobee Basin, having authority from the State to cut canals and use the natural waterways for that purpose. A canal with a minimum cross section of 22 feet by 5 feet has been opened from Lake Okeechobee to the head waters of the Caloosahatchee River, and through them as far as the western end of Lake Flirt. A rocky ledge at Fort Thompson has been removed and four cut-offs have been made across the worst bends below Fort Thompson. These works were not intended for the benefit of navigation, but they have incidentally opened a water route about 300 miles long from the Gulf of Mexico to the interior of Florida, via San Carlos Bay, the Caloosahatchee River, Lake Okeechobee, the Kissimmee River, and lakes Kissimmee, Cypress, and Tohopekaliga. Steamers now pass over the route at irregular intervals.

An examination of the river, with a view to its improvement, was made in March and April, 1879. A report thereon, dated August 27, 1879, with a plan of improvement, is printed as Appendix J 17, Report of the Chief of Engineers for 1879.

The project adopted in 1882 called for deepening the channel by dredging, from the mouth to Fort Myers, so as to give a depth of 7 feet at mean low water for a width of 100 feet. In 1886 and 1888 this project was modified so as to include the improvement of the upper river as far as Fort Thompson by the removal of snags and overhanging trees and by deepening the channel near Beautiful Islands.

The following appropriations have been made for this improvement:

Act of—	
1882	$5,000
1884	5,000
1886	4,000
1888	10,000
1890	3,600
1892	1,000
Total	28,600

OPERATIONS PRIOR TO JUNE 30, 1892.

In 1885 the 7-foot channel through the lower river was reported ompleted. In 1886–'87 the operations were confined to clearing snags nd overhanging trees from the river between Forts Denaud and hompson, and in making an instrumental survey of the entire river. his survey showed the existence of a practicable channel 6 feet deep nd at least 100 feet wide from the mouth to Fort Myers. It also showed hat, excepting near the Beautiful Islands, the channel has sufficient epth and width to permit boats of 4 feet draft to ascend the river as high as Fort Thompson. The upper river was, however, badly structed by snags and overhanging trees, only a short reach, 4½ m long, having been cleared by the work during May and June, 18

Before improvement the lower part of the river was so obstructed oyster bars that the available channel depth was only about 5¼ About 17 miles from the mouth the river loses the characteristics o estuary, and there are numerous islands and a broad shoal. At present time the river has been improved so that a navigable cha depth of about 6 feet exists between the mouth and Fort Myers, between Fort Myers and Fort Thompson it is 4 feet.

A dike or training wall alongside the cut through Beautiful I Shoals has been built. It consists of a row of piles in juxtapo driven to hard bottom, with a light waling strip on each side. A l of brush 4 feet wide is placed at the foot of the piles and held down stakes and a layer of shell and stone. Upon this was deposited material dredged from the cut. The channels through the oyster have been marked with stakes. For details of the work see An Report of the Chief of Engineers for 1891, pages 1644 and 1645.

There were no operations during the fiscal year ending June 30, 1 as the services of the United States snag and dredge boat *Su* were not available. The $1,000 appropriated by act of July 13, 1 will be expended in removing fallen trees and a small shoal near B tiful Island.

The river can be kept clear at an annual expenditure of $1,000.

Caloosahatchee River is in the collection district of Key West, which is th est port of entry; nearest light-house is Sanibel Island Light, and the near is Fort Taylor, Fla.

Money statement.

July 1, 1892, balance unexpended	$
Amount appropriated by act approved July 13, 1892	1,0
	1,0
June 30, 1893, amount expended during fiscal year	1
July 1, 1893, balance unexpended	1,0
Amount (estimated) required for maintenance of existing project	1,0
Amount that can be profitably expended in fiscal year ending June 30, 1895	1,0

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

COMMERCIAL STATISTICS.

Commerce of Caloosahatchee River, Florida, for the year ending December 31, 1

[Furnished by Capt. W. H. Towles, of Fort Myers, Fla.]

Articles.	Gross tonnage.
Cattle, beef	1,515
Fertilizers	460
Fish and oysters	90
Fruits	1,000
Hides	230
Honey, sirup, etc	15
Hogs, dressed	250
Lumber, rough and sawed	11,440
Merchandise	6,600
Vegetables	800
Total	22,400

Commerce of Caloosahatchee River, Florida, for the year ending December 31, 1892—Continued.

Vessels.	Average tonnage.	Average draft.
	Tons.	
Six steamers	30	3 feet light.
Four schooners	30	4 feet loaded.
Thirty sloops and yachts	5	2 feet.

Number of passengers carried during the year, 1,560.

Estimated percentage of total trade of neighborhood carried by water. 100 per cent.

Probable increase of trade were the improvement completed, 100 per cent.

O 9.

IMPROVEMENT OF CHANNEL OF CHARLOTTE HARBOR AND PEASE CREEK, FLORIDA.

Charlotte Harbor lies 74 miles south of Tampa Bay and offers the most southerly deep-water harbor on the west coast of Florida. It is the northern division of the broad expanse of generally shallow water included between Gasparilla, Lacosta, Captiva, and Sanibel islands and the mainland, and of which San Carlos Bay forms the southern division. A projection from the mainland, ending in Cape Haze, gives Charlotte Harbor an angular shape, with arms of nearly equal length, starting from the Gulf and running nearly east and then north. The width of the bay is about 5½ miles. The total length along the middle line is 22 miles. The total area is 111 square miles. The general depth is from 5 to 15 feet, with deeper water in places along the middle line. The entrance, Boca Grande Pass, is straight and stable in position and depth, with a least channel depth of 19 feet at mean low water. Within the entrance there is an anchorage having an area of 580 acres and a mean low-water depth of 18 feet and over. Between this anchorage and Pease Creek entrance, at the northeastern extremity of the bay, there is an available channel depth of 15 feet at mean low water, excepting on the shoals south of Cape Haze, where the available channel depth is only 9 feet. Pease Creek is described on p. 1600, volume 2, Report of the Chief of Engineers, 1890. The portion included in the improvement of Charlotte Harbor extends from the entrance to the wharves at Punta Gorda, a distance of 1¾ miles. Pease Creek is here quite broad and is really an estuary. It has an available depth of 10 feet in the channel. The tidal range of the bay and creek varies from 1.9 feet at Gasparilla Island to 1.6 feet at Punta Gorda, but it is subject to great variations, according to the strength and direction of the wind.

An appropriation of $35,000 was made in the act approved September 19, 1890, for "improving, dredging, and deepening the channel of Charlotte Harbor and Pease Creek, Florida, to the pier at Punta Gorda, the terminus of the Florida Southern Railroad."

OPERATIONS PRIOR TO JUNE 30, 1892.

A survey of the bar at the entrance and those portions of the bay and creek within the limits named in the bill, which have an available depth less than 15 feet at mean low water, was made in November and December, 1890, and January, 1891, by a party under the charge of Mr. J. H. Bacon, assistant engineer. A copy of his report is printed on 1648 of the Report of the Chief of Engineers for 1891. It was th thought that the greatest advantage to the commercial interests of harbor could be given with the appropriation available by making a across all the shoals 12 feet deep, with a least width of 60 feet, a plainly marked.

Proposals were opened, after due advertisement, and a contract made with the Alabama Dredging and Jetty Company to dredge a mark the cuts for 25 cents per cubic yard. This was approved by Chief of Engineers June 11, 1891.

On May 24, 1892, the project was modified, so that the amount avi able can be expended in deepening the channel from the wharf at Pun Gorda to Beacon No. 2, a distance of about 10,000 feet, to a depth of feet.

It is believed that the depth obtained by dredging in this portion the channel will be more likely to remain permanent than on the sh in the vicinity of Cape Haze, as the material composing the botto the former consists principally of mud, while the latter are compose sand of a more or less shifting character.

The estimated cost of forming a channel 200 feet wide and 12 deep at mean low water from the Boca Grande entrance to the w at Punta Gorda is $127,555; for a channel 200 feet wide and 15 deep it is $468,000.

The estimated cost of a channel 300 feet wide and 23 feet deep fr the Gulf of Mexico to the deep anchorage just within Boca Grande trance is $35,000.

Phosphate deposits are found in enormous quantities throughout Pease River Valley, and the shipment of phosphates forms the princ commercial interest of the harbor. The phosphate is brought by to the wharf at Punta Gorda and lightered from there to vessels in the Boca Grande anchorage. This point will be the place of sh ment for phosphates from the Caloosahatchee River also, in all pro bility. Its importance is evident. Other shipments to and f Charlotte Harbor include grain, fish, oysters, lumber, and gene merchandise. An extension of the railroad to the Boca Grande trance is projected.

OPERATIONS DURING FISCAL YEAR ENDING JUNE 30, 1893.

Work under the contract with the Alabama Dredging and J Company was begun April 17, 1893, and the dredging was comple June 20, 1893. The channel marks required by the specifications now being placed. A total of 141,293 cubic yards of material were moved. From this amount 34,296 cubic yards were dredged in ex of a depth of 13 feet and, according to the terms of the contract, be deducted from the gross amount dredged in making paymen the amount of work done. The work has resulted in forming a cha 300 feet wide for a distance of 300 feet in front of the wharf at Pu Gorda, 160 feet wide for a distance of 4,729 feet, and 120 feet wide a further distance of 1,764 feet, where it connects with the 12-foot co tours. The total length of the dredged cut is 6,793 feet. Over alm the entire area dredged the depth is in excess of 13 feet.

Charlotte Harbor is in the collection district of Key West, and Punta Gorda is nearest port of entry; nearest light-house is Gasparilla Light, and the nearest is Fort Taylor, Fla.

Money statement.

July 1, 1892, balance unexpended	$31,776.05
June 30, 1893, amount expended during fiscal year	20,272.36
July 1, 1893, balance unexpended	11,503.69
July 1, 1893, outstanding liabilities	8,740.00
July 1, 1893, balance available	2,763.69
Amount (estimated) required for completion of existing project	92,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	50,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

COMMERCIAL STATISTICS.

Commerce of Charlotte Harbor and Pease Creek, Florida, for the year ending December 31, 1892.

[Furnished by Messrs. C. W. Conally and S. P. Hinckley, of Punta Gorda.]

Articles.	Gross tonnage.	Estimated value.
Cattle	240	$24,000
Coal	648	3,240
Flour	2,068	56,860
Fish:		
Salted	320	19,200
Iced	2,480	74,400
Grain (corn and oats)	3,830	62,411
Hay	90	1,800
Lumber	216	1,152
Meal and grits	200	8,000
Oranges	40	2,000
Phosphate (pebble)	76,580	459,480
alt	280	9,600
undry packages	2,318	69,562
Total	89,330	793,705

Total tonnage entered and cleared at the port of Punta Gorda, Fla., for the year ending December 31, 1892.

	Entered.		Cleared.	
	No.	*Tons.*	*No.*	*Tons.*
eamers	74	53,521.04	74	80,404.90
iling vessels	110	23,995.09	110	36,224.76
Total	......	77,516.13	......	116,629.66

O 10.

IMPROVEMENT OF SARASOTA BAY, FLORIDA.

Sarasota Bay extends south from Tampa Bay along the west coast of
lorida. Its length between Tampa Bay and Casey Pass is 34 miles.
is separated from the Gulf of Mexico by a chain of low sandy keys,
hich vary in width from 300 feet to 1 mile.

There are five navigable entrances to the bay, one from Tampa Bay
d four from the Gulf of Mexico. These are named in their order, from
rth to south, Palma Sola or Sarasota Pass, Longboat Inlet, Big Sara-
ta Pass, Little Sarasota Pass, and Casey Pass, and have available

channel depths of 4.3 feet, 5 feet, 7 feet, 5.3 feet, and 3.5 feet, respecti Between Big and Little Sarasota passes the bay is divided in two p named Big Sarasota Bay and Little Sarasota Bay, respectively. cluster of small islands covered with mangrove bushes and know the "Mangroves." The channels between these islands are narrow crooked, at places are bare at low water.

Sarasota Bay is bordered by lands well suited for raising fruit vegetables. The country roads are few and poor. The neares roads are at Port Tampa and St. Petersburg, on the north si Tampa Bay, where are also steamship lines to Gulf ports and Cu

The products of this country include palmetto, agave, and ba fibers, honey, sugar, sirup, oranges, lemons, limes, bananas, pineap vegetables, lumber, fish, oysters, and cattle. Owing to the absen regular and economical facilities for transportation, but few of products are exported. Trade is limited to the actual necessities o population.

A navigable channel with a minimum depth of 5 feet extends thro out the length of Big Sarasota Bay excepting in two reaches, Pa Sola Pass and Long Bar, which have a total length of 5,400 feet. these reaches the available depth was 4.3 and 3.5 feet, respecti The tidal range in the bay is 1.5 feet.

An examination and survey of the bay was made in 1889. Th port thereon, with the project for improvement, is printed on page Vol. II, of the Report of the Chief of Engineers for 1890. An ap priation of $5,000 was made in the act approved September 19, for "improving Sarasota Bay from Tampa Bay to Sarasota, Fla."

The approved project calls for the formation of a continuous cha 100 feet wide and 5 feet deep at mean low water from Tampa B the town of Sarasota, Fla., a distance of 21¼ miles.

OPERATIONS PRIOR TO JUNE 30, 1892.

The United States steam snag and dredge boat *Suwanee* began op tions on October 31, 1891, and work was continued until Februar 1892, when the exhaustion of funds available necessitated its di tinuance. The work was much retarded by stormy weather an choking of the pump dredge by large clams, some as much as inches in diameter.

The work has resulted in forming a cut through the shoal near Pa Sola Point 1,673 feet long and 36 feet wide. Dredging was done depth of 6 feet to allow 1 foot for back filling. A total of 4,363.5 c yards of sand (measured in place) were removed.

The cut requires to be extended 627 feet to connect the 5-foot tours on the shoal.

OPERATIONS DURING FISCAL YEAR ENDING JUNE 30, 1893.

The act approved July 13, 1892, appropriated $2,500 for conti the work of improvement. A portion of this amount was expende making necessary repairs to the United States steam snag and d boat *Suwanee* and the balance in continuing the cut at Palma Point. The work was done during May, and resulted in conne the 5-foot contours by a cut 2,292 feet long, of which a length of feet is 38 feet wide with a depth of 6 feet, while for the remaining feet the cut is 40 feet wide and from 5 to 6 feet deep. A total am of 6,456.5 cubic yards of sand and shell (measured in place) has removed.

A close examination of the shoal near Long Bar revealed peculiar irregularities in its formation, making its removal a work of greater magnitude than was originally estimated. Accordingly on August 16, 1892, a revised estimate of cost was submitted and approved by the Chief of Engineers September 23, 1892. By this estimate the total cost of the improvement is $17,500.

Sarasota Bay is in the collection district of Tampa, which is the nearest port of entry. Nearest light-house is Egmont Key Light. Nearest fort is Fort Taylor.

Money statement.

July 1, 1892, balance unexpended	$60.27
Amount appropriated by act approved July 13, 1892	2,500.00
	2,560.27
June 30, 1893, amount expended during fiscal year	1,982.89
July 1, 1893, balance unexpended	577.38
July 1, 1893, outstanding liabilities	503.74
July 1, 1893, balance available	73.64
Amount (estimated) required for completion of existing project	10,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	10,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

COMMERCIAL STATISTICS.

Commerce of Sarasota Bay, Florida, for the year ending December 31, 1893.

[Furnished by Mr. J. Hamilton Gillespie, Sarasota, Fla.]

Articles.	Gross tonnage.	Estimated value.
ertilizers	20	$600
ish and oysters	2,000	125,000
ruits	1,200	25,000
rain	5,000	8,400
ides	½	50
oney, sirup, etc	7	750
ogs	120	2,500
umber, rough and sawed	100	1,000
erchandise	500	75,000
otatoes, sweet	90	1,500
egetables	4	750
Total	9,041½	240,550

Vessels.	Character.	Tonnage.	Draft.
		Tons.	*Feet.*
ella	Schooner	20	3
ellie Bly	do	9	2
emo	Sharpie	10	2
osa	Sloop	5	2

Passengers: About 100 (no lists kept).

Estimated percentage of total trade of neighborhood carried by water, 90 per cent.

Probable increase of trade were the improvement completed, 500 per cent.

Following is an extract from Mr. Gillespie's letter forwarding the statistics:

"These (the statistics) are all estimated, as no records are now kept here by the erchants and traders, but I have taken every care to estimate, and not to exag-erate."

O II.

IMPROVEMENT OF MANATEE RIVER, FLORIDA.

Manatee River rises in the southern part of Florida, and flows westerly direction, emptying into Tampa Bay on its southern For a distance of 12 miles from its mouth it has the characteristi an estuary. For 10 miles the settlements along its banks are al continuous. They comprise the towns of Manatee, Hendrix, E ton, Palmetto, Braidentown, and Palma Sola. Oranges and veget are raised in large quantities. From the fine ranges along the u river hides, wool, and sheepskins are exported. Phosphate dep have been discovered along the river, and mining operations are carried on.

Before improvement in the estuary the general depth of the varied from 7 to 20 feet. At the mouth there was a long shoal depth of 7 feet. Between Palmetto and Manatee there was another covered by from 3 to 5 feet of water.

An examination of Manatee River, with a view to its improve was made in 1881. A report thereon, dated February 16, 18 plan of improvement, is printed as part of Appendix K 25, A Report of the Chief of Engineers for 1882.

PROJECT OF IMPROVEMENT.

The original project had for its object to form a channel 100 feet and 13 feet deep at mean low water from Tampa Bay to Shaw and Neill points, a distance of about 4 miles. The available depth be improvement was 7 feet.

Since the original project was adopted railroad and steamship have been established which make Tampa the distributing point the neighboring portion of Florida. Accordingly, it was decided modify the project for the improvement of Manatee River so as to up the entire lower river to light-draft boats, which would co with the transportation lines centering at Tampa. The project as ified calls for the formation of a channel 100 feet wide and 8 feet at mean low water from Tampa Bay to Manatee. The inhabitan the country bordering on the Manatee desire the completion of original project.

The following appropriations have been made for this work:

Act passed August 2, 1882	$1
Act approved August 5, 1886, allotment of	1
Act passed August 11, 1888	[illegible]
Act approved September 19, 1890	[illegible]
Act approved July 13, 1892	[illegible]
Total	[illegible]

OPERATIONS PRIOR TO JUNE 30, 1892.

With the appropriations of 1882, 1886, and 1888 a dredged cut made across the bar at the mouth of the river, and a channel 10 wide and 8 feet deep at low water was dredged through the shoa tween Manatee and Braidentown. Part of the appropriation of was expended in making a survey of the river. A report the together with a map of the river, will be found on page 1109, of the Chief of Engineers for 1888.

The appropriation of $6,000 made in the act approved September 19, 1890, is still available. A channel 8 feet deep already exists from Tampa Bay to Manatee. Any further deepening of this channel should be begun at the bar at the mouth. The amount available would be barely sufficient to make a very narrow cut 12 feet deep across the bar. It is doubtful if an unprotected dredged cut of any width could be maintained there, and it is quite certain that money expended on a narrow cut would give no useful results.

On June 18 and 19, 1892, an examination was made of the outer bar and of the bulkhead lying in the mouth of the river between Snead and Shaws points. It was found that an available channel depth of at least 9 feet already exists on the outer bar, and that a cut through the bulkhead above referred to can be so located that advantage can be taken of the direction of the currents, so that its permanence would be reasonably assured. The steamboat men were very anxious to have this cut made, as it would materially shorten and straighten the channel and avoid the necessity of crossing a long stretch of water having a depth of only 8 feet.

OPERATIONS DURING FISCAL YEAR ENDING JUNE 30, 1893.

The act approved July 13, 1892, appropriated $6,000 for continuing work on the Manatee River. This sum, with the $6,000 on hand, made t possible to begin work advantageously, and accordingly a project was submitted for repairing the United States steam snag and dredge boat *Suwanee*, and then to use the boat in making a cut 100 feet wide and 12 feet deep at mean low water through the bulkhead at Snead Point. A cut at this point was adopted because of the immediate advantage it would give the trade of the river as far as Palmetto, a distance of 7 miles, whereas the sum available was not sufficient to begin work upon the outer bar. The projected cut is estimated to require the excavation of 36,400 cubic yards of material (in place), and the work is now being done by the dredge boat *Suwanee.* Work was begun in June, 1893. One thousand three hundred and eighty-nine cubic yards of material measured in place) were removed. It is expected that the work will be completed before December, 1893.

Manatee River is in the collection district of Tampa. Tampa is the nearest port of entry. Nearest light-house is Egmont Key Light; nearest fort is Fort Taylor, Fla.

Money statement.

uly 1, 1892, balance unexpended	$6,021.87
mount appropriated by act approved July 13, 1892	6,000.00
	12,021.87
une 30, 1893, amount expended during fiscal year	7,574.58
uly 1, 1893, balance unexpended	4,447.29
uly 1, 1893, outstanding liabilities	991,64
uly 1, 1893, balance available	3,455.65
Amount (estimated) required for completion of existing project	33,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	15,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

COMMERCIAL STATISTICS.

Commerce of Manatee River, Florida, for the year ending December 31, 1892.

[Furnished by Capt. J. W. Fitzgerald, superintendent Plant Steamship Line.]

Articles.	Gross tons.	Estimated value.
Box material	300	$3,000
Flour	484	24,200
Fertilizers	399	15,960
Fish and oysters	73	2,405
Fruits	2,107	79,200
Grain	1,272	26,712
Groceries	80	23,000
Hay	172	2,880
Honey and sirup	73	10,000
Lumber (rough and sawed)	4,500	45,000
Merchandise	3,427	247,700
Meal and grits	208	9,360
Meats (fresh and salted)	96	17,760
Tobacco (leaf and manufactured)	112	56,000
Vegetables	7,648	253,140
Total	20,951	816,326

Estimated percentage of total trade of neighborhood carried by water, 90 per cent.

Vessels.	Character.	Tonnage.	Draft.
		Tons.	*Feet.*
Steamer, daily trips	Side wheel	350	8
Steamer making triweekly and, during the fruit and vegetable season, daily trips.	....do	175	6

O 12.

IMPROVEMENT OF TAMPA BAY, FLORIDA.

Tampa Bay is a large indentation in the Gulf coast of Florida, with an average width of from 6 to 7 miles, and a length, including Hillsboro and Old Tampa bays, into which its inner end is divided, of 35 miles. Across the bar and up to the point of division, a distance of 25 miles, the channel has a depth of from 20 to 38 feet.

Old Tampa Bay, the northwestern division, is about 10 miles long, with an average width of 5½ miles. Near its mouth there is a channel depth of over 20 feet of water. A depth of 10 to 12 feet extends to its head. Hillsboro Bay has an average width of 5 miles, with a depth varying from 16 feet at the mouth to 8 feet near the head. Flats with low-water depths of from 1 to 5 feet, varying in width from one-quarter to 1 mile, surround the entire body of water.

Its principal tributary is the Manatee River. The principal town is Tampa, lying at the mouth of the Hillsboro River, at the head of the Hillsboro Bay, but separated from the deep water of the bay by a broad flat, through which runs a narrow channel formed by the waters of the Hillsboro River. Through this, before improvement, vessels drawing 8 feet of water were able to reach Tampa only by taking advantage of high tides. The Florida Central and Peninsular Railroad has its terminus at Tampa.

The South Florida Railroad now has its terminus at Port Tampa near the mouth of Old Tampa Bay, where it makes connection with steamship lines for Key West, Havana, Mobile, and Central American ports. Port Tampa is about 9½ miles from Tampa, with which city it is connected by the railway, and for which it is the deep-water port.

An examination of Tampa Bay, with a view to its improvement, was made in 1879. A report thereon, dated August 25, 1879, with a plan of improvement, is printed as Appendix J 18 to the Report of the Chief of Engineers for 1879.

FORMER PROJECT OF IMPROVEMENT.

The improvement proposed was to deepen and widen the channel from Tampa to the bay, a distance of 5¾ miles, by dredging and rock excavation, so as to give a clear depth of 9 feet at mean low water and a width in the river of 200 feet and in the bay of 150 feet.

The following appropriations have been made for this improvement:

By act approved—	
June 14, 1880	$10,000
March 3, 1881	10,000
By act passed August 2, 1882	20,000
By act approved—	
July 5, 1884	20,000
August 5, 1886	10,000
By act passed August 11, 1888	25,000
By act approved—	
September 19, 1890	25,000
July 13, 1892	10,000
Total	130,000

The work consisted entirely of dredging and rock excavation, and was done by contract.

OPERATIONS PRIOR TO JUNE 30, 1888.

The work of dredging extended over a length of 8,200 feet, making a cut varying in width from 200 feet in the river to 60 feet in the bay. In the bay it has been partly filled by cross-tidal currents. On June 30, 1887, it had a depth along the center line of from 8.3 to 9 feet. The depth in the bay beyond the outer extremity of the cut is 7 feet. The estimated cost of completing the dredged channel called for by this project is $63,000.

MODIFIED PROJECT.

In 1888 the project was changed. It now contemplates the formation of a channel 8 feet deep in Hillsboro Bay and Hillsboro River to the city of Tampa, and the formation of a channel 200 feet wide and 20 feet deep at mean low water from the outer bar to Port Tampa.

The estimated cost of the revised project was $60,000. Two appropriations have been made in the acts of 1888 and 1890, aggregating $50,000.

OPERATIONS PRIOR TO JUNE 30, 1892.

Operations were carried on under a contract with Mr. D. G. Ambler dated March 22, 1889. The contract was completed March 28, 1891. During the entire contract 63,459 cubic yards of sand, shell, and silt were removed from the lower bulkhead (that at the entrance to Old Tampa Bay) and 12,058 cubic yards from the upper bulkhead (near Port

Tampa). When work was suspended the cut at the entrance had mean low-water depth of 20 feet and a width of 115 feet for one-half length and of 100 feet for the remaining distance, with an additio width of 75 feet the entire length, having a mean low-water depth of 16 feet. The upper cut was 150 feet wide, with a mid-channel depth of 19.7 feet. The tidal range is 1.5 feet.

A resurvey of the Hillsboro Bay Channel was made in January, 18 by Mr. J. H. Bacon, assistant engineer. His estimate of the cost of completing an 8-foot channel 150 feet wide to Tampa is $33,000.

On May 11, 1891, proposals for continuing dredging operations marking the cuts in Old Tampa and Hillsboro bays, under the appropriation of September 19, 1890, were opened after due advertisemen A contract for the work at 25 cents per cubic yard was made with Alabama Dredging and Jetty Company, which was approved by Chief of Engineers, June 11, 1891. Dredging under this contract begun in Old Tampa Bay December 19, and continued until May 1892, when the channel called for by the project was completed. Twenty-three thousand six hundred and seventy cubic yards were moved from the lower bulkhead and 7,921 cubic yards from the upper bulkhead, a total under that contract of 31,591 cubic yards. Si commencement of work 95,050 cubic yards have been removed from lower bulkhead and 19,979 cubic yards from the upper bulkhead, a to of 115,029 cubic yards.

Dredging, under the same contract, was begun in Hillsboro Bay April 7, 1892. Up to June 30, 1892, 21,073.2 cubic yards had dredged, making a channel throughout the entire distance between 8-foot contours 8 to 9 feet deep and of a least width of 70 feet. In bend near Spanish Town Point the width has been increased to feet.

OPERATIONS DURING FISCAL YEAR ENDING JUNE 30, 1893.

Work under the appropriation made in act of September 19, 1 was continued until July 31, 1892, when the available funds were hausted. The act approved July 13, 1892, appropriated $10,000 this improvement. A contract for doing the work was entered December 20, 1892, with Mr. J. A. Bryan. The contract was appro by the Chief of Engineers on December 29, 1892. Work was be January 9, 1893, and was completed June 3, 1893. During the 932.2 cubic yards of rock and 30,237.9 cubic yards of sand were remo from the channel, which is now 200 feet wide in the mouth of the H boro River, and from 75 to 100 feet wide in the bay, and from 8 to feet deep throughout.

Tampa Bay is in the collection district of Tampa, which is the nearest p entry. Nearest light-house is Egmont Key Light. Nearest fort is Fort Taylor,

Money statement.

July 1, 1892, balance unexpended	$10.0
Amount appropriated by act approved July 13, 1892	10.0
	20.0
June 30, 1893, amount expended during fiscal year	16.
July 1, 1893, balance unexpended	3.2
July 1, 1893, outstanding liabilities	3.
July 1, 1893, balance available	[illegible]

Abstract of proposals for dredging in Tampa Bay, Florida, received in response to advertisement and opened November 19, 1892, by J. C. Mallery, major, Corps of Engineers.

No.	Name of bidder.	Prices per cubic yard.	
		Sand.	Rock.
1	J. A. Bryan	$0.33	$4.77
2	Rittenhouse Moore Dredging Co	0.35	5.50

The estimated amount available for work according to the approved project is $9,000.

Recommended that bid No. 1 be accepted.

COMMERCIAL STATISTICS.

Commerce of Tampa Bay and Hillsboro River, Florida, for the year ending December 31, 1892.

Furnished by Capt. J. W. Fitzgerald, superintendent Plant Steamship Line, and Mr. F. A. Salomonser, mayor of the city of Tampa, Fla.]

Articles.	Gross tonnage.	Estimated value.
Box material	300	$3,000
Coal:		
Bituminous	4,952	22,284
Anthracite	443	2,879
Cement, Portland	600	6,000
Coffee	15	7,500
Cigars	1,250	3,575,000
Cheese, butter, and eggs	45	29,000
Flour	3,532	176,600
Fish and oysters	564	33,840
Fertilizers	7,276	254,660
Grain (corn and oats)	8,728	183,288
Hay	2,276	38,236
Hides	117	20,000
Ice	52	520
Iron, manufactured	16	12,800
Lemons and limes	104	5,200
Lime and plaster	288	7,200
Lumber (sawed and rough)	4,811	106,440
Live stock	88	8,800
Liquors	268	45,942
Meats (fresh and salted)	324	64,800
Meal and grits	1,128	50,760
Molasses and sirup	12	756
Merchandise	75,712	3,028,480
Oils	20	2,857
Oranges	2,138	106,900
Phosphate:		
Hard rock	35,874	358,740
Pebble	31,298	187,778
Tobacco:		
Leaf	700	350,000
Manufactured	16	12,600
Vegetables	292	7,300
Total	183,723	8,777,560

Total tonnage, foreign and domestic, entered and cleared during the year ending December 31, 1892, 240,000 tons.

Amount of customs duties received during the year ending December 31, 1892, $60,000.

Estimated percentage of total trade of neighborhood carried by water, 50 per cent.

Estimated increase of trade were the improvement completed, 50 per cent.

O 13.

IMPROVEMENT OF WITHLACOOCHEE RIVER, FLORIDA.

The Withlacoochee River rises not far from Kissimmee, south of the center of the peninsula of Florida, and flowing north and west reaches the Gulf of Mexico at a point about 20 miles southeast of Cedar Keys. It has a total length of 120 miles. Pemberton Ferry, made the present head of navigation by the railroad trestle bridge of the South Florida Railroad, is 77 miles from the mouth. The roads of the Florida Railway and Navigation Company and of the Silver Springs, Ocala and Gulf Railroad Company touch the river at Panasoffkee and Dunnellon, respectively 57 and 31 miles from the mouth. The country bordering the river consists mainly of fine hummock land and cypress swamps. Large quantities of fruits and vegetables are grown, and the country is fast being settled. Extensive deposits of phosphates have been discovered along the lower river.

The absence of good wagon roads and of parallel railroads greatly increases the importance of the Withlacoochee River as a means of communication and transportation.

Before improvement this river was so badly obstructed that no regular navigation was possible, and the river was used only for rafting cedar logs or for an occasional push boat. The obstructions consisted of ledges of limestone rock, sand bars, snags, and overhanging trees. At certain points the river expands in broad, marshy lakes and cypress swamps, in which there is no clearly defined channel. The general depth was from 1 to 7.5 feet, with a width of from 75 to 180 feet.

Operations for the improvement of this river have been carried on in accordance with the project submitted to the Chief of Engineers in 1[illegible] by the officer then in charge, and published as part of Appendix K [illegible] to the Annual Report of the Chief of Engineers for 1880.

PROJECT OF IMPROVEMENT.

The project adopted is to improve the river by the removal of snags, overhanging trees, and loose rocks, and the deepening of some of the worst shoals and a bar at the mouth of the river, so as to enable boats drawing 2 feet to navigate the river during about one-half the year from the mouth to Hays Ferry, a distance of 71 miles. In 1886 the project was modified to permit the improvement to be continued as far as Pemberton Ferry, 6 miles from Hays Ferry.

OPERATIONS PRIOR TO JUNE 30, 1892.

Work was carried on under the following appropriations:

By act approved—	
March 3, 1891	[illegible]
July 5, 1884	[illegible]
August 5, 1886	[illegible]
By act passed August 11, 1888	[illegible]
By act approved September 19, 1890	[illegible]
Total	[illegible]

The work was done partly by hired labor and partly by contract. The entire river from the mouth to Pemberton Ferry was gone over and the worst obstructions were removed.

At the close of operations the channel called for by the project had been formed between Pemberton Ferry and Dunnellon, though the are still obstructions which must be removed before navigation is safe. Between Dunnellon and the mouth are two dangerous rock ledges and many overhanging trees which require removal.

The snag boat *Suwanee* arrived at the mouth of the river on March 23. On account of the extraordinary low stage of the river the boat could not go further up than about 18 miles below Dunnellon. An examination of the entire river was made, the low stage of water giving a very favorable opportunity. It was decided to lay up the boat, fit out a party from the crew, and proceed with the work of blasting the shoals, removing rock, and building training walls with the débris. The work of improvement has extended throughout the entire river from Pemberton Ferry to the mouth, and the channel called for by the project is nearly completed.

During the progress of the work 79 snags and 10 overhanging trees were removed, 465 cubic yards of rock were blasted, 296 cubic yards of rock removed from the channel, and 128 linear feet of dams were built.

OPERATIONS DURING FISCAL YEAR ENDING JUNE 30, 1893.

During the past fiscal year operations were continued until the money available was exhausted. Six snags and 454 overhanging trees were removed, and 104 trees were trimmed.

The channel is now practically clear and available for navigation for boats drawing 2 feet of water during one-half the year.

Withlacoochee River is in the collection district of St. Marks, Fla., of which Cedar Keys is the nearest port of entry. Nearest light-house is Cedar Key Light; nearest fort is Fort Marion, Fla.

Money statement.

July 1, 1892, balance unexpended	$2,850.74
June 30, 1893, amount expended during fiscal year	2,839.29
July 1, 1893, balance unexpended	11.45
Amount (estimated) required for maintenance of existing project	800.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	800.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

COMMERCIAL STATISTICS.

Commerce of Withlacoochee River, Florida, for the year ending December 31, 1892.

Articles.	Gross tonnage.	Estimated value.
Fertilizers	800	$28,000
Fruits	1,630	63,378
Grain	950	23,000
Hides	2	100
Honey, sirup, etc	15	1,250
Logs	25,000	15,000
Merchandise	2,017	100,850
Vegetables	250	8,500
Phosphate	75,000	450,000
Total	105,664	690,078

Vessels.	Character.	Tonnage.
Sam Pyles	Stern-wheel steamer	62.81

O 14.

IMPROVEMENT OF HARBOR AT CEDAR KEYS, FLA.

The harbor at Cedar Keys is the most northern harbor on the gulf side of the peninsula of Florida. It is formed by the tidal channels between a group of small islands or keys, of which Way Key, on which is situated the town of Cedar Keys, is the largest. Cedar Keys is the terminus of the central division of the Florida Central and Peninsular Railway. Its principal business is in cedar lumber, though it also forms a distributing point for supplies and general merchandise for an area to the north and south.

An examination of the harbor with a view to its improvement was made in November, 1883. A report thereon, together with a plan of improvement, was printed as Appendix N 30 to the report of the Chief of Engineers for 1884.

PROJECT OF IMPROVEMENT.

The approved project, as there described, is as follows: To obtain a channel 200 feet wide and with a least depth of 10½ feet from Cedar Keys to the Gulf of Mexico. A depth of 9½ feet formerly existed in this channel. The depth is limited by the existence of beds of rock under the entire channel from 9½ to 12½ feet below mean low water, which could only be removed at greater expense than the present and prospective commerce of the port would seem to warrant. The estimated cost of completing this project is $46,500.

Operations have been carried on under the following appropriations, viz:

Act of—	
July 5, 1884	$5,000
August 5, 1886	7,000
August 11, 1888	7,500
September 19, 1890	2,500
Total	22,000

The appropriation in the act approved September 19, 1890, was made in the following terms:

> Improving harbor at Cedar Keys, Fla.: Continuing improvement, $2,500, a part of which may be expended at Derrick Island Gap, on the inside channel from Suwanee River.

OPERATIONS PRIOR TO JUNE 30, 1892.

Between 1872 and 1881 cuts 200 feet wide and 11½ feet deep were made through the middle ground and through the outer bar. Under the appropriation of 1884 a cut 12 feet deep, partly through rock, was started near Buoy No. 12. It was never completed, owing to the exhaustion of the appropriation. The appropriation of 1886 was expended in reopening the cut through the middle ground, giving it a direction as nearly as possible coincident with the direction of the tidal currents. It was made 70 feet wide and 10½ feet deep. The appropriation of 1888 was expended in widening the same cut to 200 feet entirely through the middle ground with a least depth of 9½ feet, excepting for a width of 60 feet along the east side, where it is 10 feet deep.

The work of dredging through the oyster bars in the vicinity of Derrick Gap, or the inside passage between the mouth of the Suwanee

River and Cedar Keys, under the appropriation of September 19, 1890, was begun by the United States steam snag and dredge boat *Suwanee* on August 11, 1891, and ceased, owing to the exhaustion of funds, on September 18, 1891; 3,962 cubic yards were dredged.

The aggregate length of the cuts at this place is 1,196 feet. The width is 37½ feet, and the depth 6 feet at mean low water. Three hundred and ninety-eight cubic yards of sand and oyster shells were dredged at the crib stake of the East Pass, mouth of the Suwanee River, removing a small shoal at that place. A cut was made 380 feet long and 75 feet wide for 167 feet of its length and 37½ feet wide for the remainder of the distance. The depth was 4½ feet at mean low water. Seventeen channel stakes, consisting of palmetto piles, were placed in the passage. A three-pile beacon was erected at the south end of the cut between Cedar Keys and Depot Key. A similar beacon was established at the northeast end of the cut in Cedar Keys Harbor.

OPERATIONS DURING FISCAL YEAR ENDING JUNE 30, 1893.

There were no operations during the past fiscal year.

The primary object in the improvement of this harbor, as called for in the project, no longer exists, as the commercial importance of the town of Cedar Keys has steadily declined for some years as far as seagoing traffic is concerned; but as forming a part of the inside passage between the mouth of the Suwanee River and the town of Cedar Keys, and for which the appropriation of September 19, 1890, was made available for "improving the channel in the vicinity of Derrick Island Gap," the improvement is still worthy of continuance.

Efforts were made to secure commercial statistics of the harbor from leading business men of Cedar Keys, both by mail and personal application, but without success.

Cedar Keys is in the collection district of St. Marks, of which Cedar Keys is the headquarters. Nearest light-house, Cedar Keys Light; nearest fort is Fort Marion, Fla.

Money statement.

July 1, 1892, balance unexpended	$205.91
June 30, 1893, amount expended during fiscal year	194.61
July 1, 1893, balance unexpended	11.30
Amount (estimated) required for completion of existing project Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867.	44,000.00

O 15.

IMPROVING SUWANEE RIVER, FLORIDA.

The Suwanee River rises in the southern part of Georgia, near the Okefinokee Swamp, and, flowing in a general southerly direction, empties into the Gulf of Mexico a few miles north of Cedar Keys. The portion examined with a view to its improvement extends from Ellaville to the south. The country adjacent is well wooded, and the chief trade is in pine, cypress, and cedar timber, cotton, sirup, the minor farm products, and naval stores. Beds of phosphate rock have been discovered along the upper river.

Previous to the improvement the obstructions in the portion of river under improvement consisted principally of shoals, composed soft, unstratified limestone mixed with flint, extending either pa or entirely across the river, in some instances covered with shall deposits of sand and in others bare. The channels across these sh were often narrow and very crooked and their depths at extreme l water varied from 15 inches to 3 feet. At other places large, isola limestone bowlders in the channel were constant sources of danger navigation.

An examination of this river with a view to its improvement w made in 1879. A report thereon, dated August 26, 1879, with a pl of improvement, is printed as Appendix J 16, Report of the Chief Engineers for 1879.

PROJECT OF IMPROVEMENT.

The proposed improvement consists in deepening the bar at passes by dredging, the removal of snags and overhanging trees al the river, and deepening and improving the channel at various pla by the removal of rocks and snags, and construction of dams, so as straighten, widen, and deepen the channel. The depth to be obtai is 5 feet through the bars at the passes for a width of 150 feet and the river as far as New Branford, a distance of 80 miles. From th to Ellaville, a distance of 50 miles, the depth is to be 4 feet and width 60 feet.

OPERATIONS PRIOR TO JUNE 30, 1892.

Work was done under the following appropriations:

By act approved—	
June 14, 1880	$5
March 3, 1881	3
By act passed August 2, 1882	5
By act approved—	
July 5, 1884	5
August 5, 1886	5
By act August 11, 1888	15
By act approved—	
September 19, 1890	3
July 13, 1892	3
Total	44

Ten thousand dollars of the appropriation of August 11, 1888, w expended in the construction of a steam snag boat, with dredging a pile-driving machinery, for use on the rivers of the west coast of Fl ida. The total amount appropriated for work on the river is $34.

Operations under the appropriations of 1880, 1881, 1882, and 1 consisted entirely in dredging across the Suwanee Basin at the E Pass. On this line the distance from deep water of the Gulf to de water in the river is 15,600 feet. A cut 5,835 feet long, 60 feet w and 5 feet deep at mean low water was made, leaving a length of 9. feet to be dredged through water having an average depth of 3½ fe This channel has since partly filled up.

Since 1886 the work in the upper river has comprised removing sn and overhanging trees, blasting and removing rocks and bowlders, a constructing wing dams with the broken rock. A small amount dredging was done at the Derrick Island Pass, at the entrance.

Work under the appropriation of September 19, 1890, which beg on the river between Branford and Ellaville on May 17, 1891, was co tinued until July 6. Under this appropriation the following work was accomplished, viz:

Cubic yards of rock blasted	261.1
Cubic yards of rock removed	561.4
Snags (8 inches to 2 feet in diameter) removed	10

As a result of the work on this portion of the river there exists a navigable channel with not less than 3 feet in depth at the lowest known stage (1.1 feet below ordinary low water) as far as Hudson, although in two places the channel having this depth is only 30 feet wide.

The narrow, crooked channels, rapid currents, and rocky bed of that portion of the river between Ellaville and Branford render navigation dangerous whenever the water is low.

From Branford to the mouth the channel is in good condition. The channel through the Suwanee Basin is crooked, narrow in places, and has a least mean low-water depth of 3 to 4 feet.

On July 6 preparations were begun for proceeding to the work in the vicinity of Derrick Gap. The snag boat *Suwanee* left Branford July 8 and arrived at Cedar Keys on the 11th, where stores were taken on board and the machinery arranged for hydraulic dredging. The boat returned to Derrick Gap July 14, and preparation for work was continued. A careful survey of the channel was made and the line of the proposed cut laid out. On July 22 dredging was begun. Considerable difficulty was experienced in adapting the suction cutter to the character of the material found, which consisted principally of oyster shells. The work was also interrupted by severe wind squalls, which caused the mooring piles to be pulled down and the boat to get out of position. Most of the appropriation having been expended on the upper river, only 607 cubic yards of material were removed. The boat continued work under the appropriation for "improving harbor at Cedar Keys, Fla.: Continuing improvement, $2,500, a part of which may be expended at Derrick Island Gap, on the inside channel from Suwanee River." With the two appropriations a channel 1,196 feet long and 6 feet in depth was made.

OPERATIONS DURING FISCAL YEAR ENDING JUNE 30, 1893.

There were no operations during the fiscal year other than repairing the United States steam snag and dredge boat *Suwanee*. Extensive repairs have been made to the boat with a view of better adapting it to the work along the Gulf coast of Florida. The boat is now at work in the Manatee River and will begin work on the Suwanee River as soon as its services are available.

FUTURE OPERATIONS.

The Suwanee River commerce comprises the movement of freight, farm produce, and naval stores to and from the railroads at Ellaville, New Branford, and Cedar Keys, and the rafting of cedar and other timber to the mills of the same towns. The roads are few and bad, and the bulky produce can only be moved to advantage by water, so that an improvement of the stream which will make it continuously navigable is essential to the prosperity of the river valley. Excepting the traffic to and from Cedar Keys there is no movement of freight out of the mouth of the river. This fact renders it unnecessary to extend the cuts previously made through the Suwanee Basin to the deep water of the gulf, and restricts the work under the project, which the present commercial status renders necessary, to the clearing of the river channel proper and the dredging of the oyster bars from the Derrick Isl Pass at the mouth.

Several phosphate mines contiguous to the lower portion of the strea are being opened and barges have been constructed for the purpos carrying the product of the mines to the mouth of the river and throu the Suwanee Basin to a point near Cedar Keys, there to be loaded o seagoing vessels. This makes the improvement of the channel at mouth and through Derrick Gap entrance of still greater importan

The Suwanee River is in the collection district of St. Marks. Cedar Keys is nearest port of entry. Nearest fort is Fort Marion. Nearest light-house, Ce Keys Light.

Money statement.

July 1, 1892, balance unexpended	$2
Amount appropriated by act approved July 13, 1892	3,0
	3,2
June 30, 1893, amount expended during fiscal year	1,8
July 1, 1893, balance unexpended	1,3
Amount (estimated) required for completion of existing project	21,1
Amount that can be profitably expended in fiscal year ending June 30, 1895	10,0

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

COMMERCIAL STATISTICS.

Commerce of Suwanee River, Florida, for the year ending December 31, 1892.

[Furnished by Mr. D. E. Horn, secretary Suwanee River Transportation.]

Articles.	Gross tonnage.	Esti
Barrels, empty	216	$
Cotton seed	120	
Cotton (sea island)	315	12
Cedar logs	6,336	10
Cedar in cases	810	11
Fertilizers	120	
Fish and oysters	14	4
Fruits (oranges)	45	
Grain	1,500	5
Honey and sirup	60	
Hay	100	
Lumber (rough)	6,250	....
Lumber (sawed)	500	9
Merchandise	7,500	
Ship stores	10,560	2
Vegetables	15	
Total	34,461	1,5

Vessels.	Character.	Tonnage.	Dra
Belle of Suwanee	Stern-wheel steamer	183	2½

NOTE.—There has been an increase in the traffic on the river of about 20 per during the year. About 80 per cent of the total trade of the country along the r between Luraville and Cedar Key, is carried by water. Mr. R. A. Ivey, presi of the Suwanee River Transportation Company, states that if all the obstruct were removed from the river there would be an increase of at least 45 per cent in traffic of the country adjacent thereto. Mr. Ivey anticipates that there will be increase of about 40 per cent in the phosphate shipments, and one of 15 per cent those of cotton and naval stores during the year 1893.

THOMAS S. SHELLEY, *Clerk.*

O 16.

PRELIMINARY EXAMINATION OF HARBOR AT CAPE CANAVERAL, FLORIDA.

[Printed in House Ex. Doc. No. 54, Fifty-second Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington D. C., December 5, 1892.

SIR: I have the honor to submit the accompanying copy of report, dated September 28, 1892, by Maj. J. C. Mallery, Corps of Engineers, of the results of a preliminary examination of harbor at Cape Canaveral, Florida, made to comply with provisions of the river and harbor act approved July 13, 1892.

Major Mallery states that the harbor at Cape Canaveral is worthy of improvement and is of opinion that $2,500 will be required to pay the expenses of surveys necessary to the preparation of project and plan with estimate of cost of improvement proposed.

Col. Wm. P. Craighill, Corps of Engineers, the division engineer, in forwarding Major Mallery's report, remarks that he considers a harbor at Cape Canaveral a very desirable improvement and worthy to be undertaken by the United States, unless the proposed survey should show it to be a work of very great expense out of proportion to the interests involved.

I concur in Major Mallery's opinion that the locality is worthy of improvement.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

Hon. S. B. ELKINS,
Secretary of War.

REPORT OF MAJ. J. C. MALLERY, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Asheville, N. C., September 28, 1892.

GENERAL: In compliance with Department letter of July 20, 1892, I have the honor to report that a harbor at Cape Canaveral, Fla., is worthy of improvement and for the following reasons:

(1) There is no deep-water harbor on the east coast of Florida or in fact on the Southern coast south of Port Royal, N. C.

(2) A harbor at Cape Canaveral would be of great advantage to the agricultural and phosphate interests of Florida, to the Navy, and to the merchant marine.

The following table gives the number of vessels damaged or lost, the value of the property lost, and the number of lives lost on east coast of Florida from October, 1865, to March, 1892:

[From data furnished by Thos. S. Eells, underwriter's agent.]

Localities.	No.	Property reported lost.	Lives reported lost.
Near Fernandina entrance	15	$410,000	None.
Near Nassau entrance	3	55,000	Do.
Near St. Johns entrance	26	458,000	18
Near St. Augustine entrance	14	180,000	None.
Near Cape Canaveral entrance*	32	1,567,800	96
Total	90	2,670,800	114

* Includes vessels damaged or lost between Mosquito Inlet and Cape Florida.

Only one vessel has grounded on St. Johns Bar since 1885.

Of the thirty-two vessels lost near Cape Canaveral six were uninsured, and their value is not included in the above list.

In addition to the ninety vessels in the above list, eight were lost off the east Florida coast at unknown points. The value of these is not included in the list.

(3) The site is favorable in that it is protected from the northeast gales, which are the most severe and of the longest duration. It is exposed to the southeast storms, which, though severe at times, do not last for a long time.

(4) The holding ground at the anchorage is good.

(5) The Jacksonville, St. Augustine and Halifax River Railroad is building at present to Rockledge, 12 miles from Cape Canaveral, and I am informed that a railroad will be built to Cape Canaveral as soon as Congress makes an appropriation for the harbor.

The following are the principal objections:

(1) Great expense, as a short breakwater will not shut off the swell of the ocean.

(2) The shifting character of the beach and bottom.

The ocean has been washing away the beach opposite Cape Canaveral light-house to such an extent that the light-house engineer has been obliged to protect the light-house site, and Congress has appropriated money to move the light-house to a secure location.

(3) There are no buildings, roads, or materials suitable for the work in the neighborhood, and the present anchorage under the lee of Cape Canaveral is so insecure that the risk of bringing materials by sea would be much increased.

The estimate for a survey for a harbor is $2,500.

The following-named papers furnished by Mr. Henry H. Harrison are respectfully submitted herewith:

(*a*) Letter of Mr. Henry H. Harrison.
(*b*) Petition of the steamship lines of New York and the Gulf ports.
(*c*) Extension of the railroad system of south Florida to Canaveral.
(*d*) Memorial, Chamber of Commerce and Industry of Louisiana.

Very respectfully, your obedient servant,

J. C. MALLERY,
Major, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. William P. Craighill, Corps of Engineers, Division Engineer, Southeast Division.)

[Third indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., October 11, 1892.

Respectfully submitted to the Chief of Engineers.

For the reasons stated by the district engineer I consider a harbor at Cape Canaveral a very desirable improvement and worthy to be undertaken by the United States unless the proposed survey should show it to be a work of very great expense, out of proportion to the interests involved.

WM. P. CRAIGHILL,
Colonel, Corps of Engineers.

a. LETTER OF MR. HENRY H. HARRISON, COMMISSIONER.

TALLAHASSEE, FLA., *August 13, 1892.*

DEAR SIR: Referring to your letter of July 28, I herewith inclose certified copies of the resolutions adopted by the chamber of commerce, board of trade, and board of underwriters of New Orleans in favor of a national harbor of refuge at Canaveral, Fla.

The officers and leading members of the Maritime Association of New Orleans and of the chamber of commerce and the cotton exchange of Mobile have undertaken to have favorable action taken by those bodies; but I have not yet received the papers.

I also inclose certified copies of the petitions of the representatives of all the steamers plying between New York and the Gulf ports and between the Gulf ports and foreign countries, and of the great railroad systems which reach the Gulf ports. These represent a very large percentage of the total coastwise and foreign commerce of the United States.

Both houses of the legislature of Louisiana adopted a memorial to Congress in favor of this harbor of refuge, but I have not received a certified copy yet from the secretary of state of Louisiana. Whenever these documents are received they will be filed in your office.

The business men of New York have promised a memorial from that State at the next session of their legislature.

Memoranda as to railroad extensions to Canaveral and business of the Indian River section are submitted herewith in reply to your inquiries.

I expect to call at your office in a short time, and am ready to exhibit the originals of all these memorials, petitions, resolutions, etc. If the copies certified by myself are not such "certified copies" as you desire, I would suggest that you cause proper copies to be taken in your office, as the originals are to be laid before Congress.

The construction of the railroad from Kissimmee to Canaveral is simply waiting upon the action of Congress in this matter, and it is greatly desired by all of our people that the report and estimates should be laid before Congress at its meeting in December next, so that the promised appropriation can be obtained next winter.

Your attention is respectfully invited to the recommendation of the Navy Department and those of the representatives of the American and foreign merchant marine, and to the great importance both to the national Navy and to navigation and commerce of an accessible deep-water harbor and coaling station at the Atlantic entrance to the Straits of Florida.

These documents are submitted and these statements made under authority of my commission from the State of Florida and the south Florida counties. If you desire further evidence of the importance of this improvement to the people of south Florida, the boards of county commissioners of those counties will be glad to have an opportunity to confer with you at Titusville, Kissimmee, and Orlando.

Respectfully,

HENRY H. HARRISON,
Commissioner.

Maj. J. C. MALLERY,
Corps of Engineers, U. S. A.

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b. PETITION OF THE STEAMSHIP LINES OF NEW YORK AND THE GULF PORTS.

The undersigned, operating the lines of steamships plying between New York and the Gulf of Mexico, respectfully urge the great importance to navigation and commerce of constructing a breakwater and national harbor of refuge in the bight of Canaveral, according to the prayer of the memorial of the State of Florida and the recommendation of the Navy Department.

N. Y. & Cuba M. S. S. Co. by Henry P. Booth, presdt.; C. H. Mallory & Co., agents Mallory S. S. Lines; Saml. H. Seaman, genl. agt. Cromwell S. S. Co.; J. T. Van Sickle, agt. Morgan Line Str.; J. M. Ceballos & Co., agents Spanish Transatlantic Co.; Albert Kinkle, general manager N. Y. and Gulf S. S. Co.

We concur in the above: Wm. J. Sanders, agent West India and Pacific S. S. Co.; Silas Weeks & Co., agts. Miss. and Dom. S. S. Co.; A. K. Milles, Meletta & Co., agents "Elgin," "Hamburg," "Packet," "Perillos," and "Lompart" Lines S. S.; American Trading Society, limited; New Orleans Agency, E. Diered, agents La Flecha Line of S. S., assistant manager; p. pro Lucas E. Moore & Co., agents Hall Line Steamers; W. E. Raymond p. p. S. V. Fornaris & Co., agts. French Commercial Line of Steamships, P. J. Esnard; Alfred Le Blanc, agent Harrison Line Steamers; E. E. Prevost, gen. so. agt., Cie. G'le Transatlantique; W. J. Hammond & Co., agents, "Ross," "Thomson," "Dent," and "Brown" Lines Steamers; Alf. Moulton & Co., agents Cromwell S. S. Co.; Ross, Howe & Merrow S. S. agents.

The Senate and House of Representatives of the United States.

PETITION OF THE SOUTHERN RAILROAD SYSTEMS CONNECTING WITH THE GULF PORTS.

The undersigned, operating the lines of steamships plying between New York and the Gulf of Mexico, respectfully urge the great importance to navigation and commerce of constructing a breakwater and national harbor of refuge in the bight of Canaveral, according to the prayer of the memorial of the State of Florida and the recommendation of the Navy Department.

Southern Pacific Co., per A. C. Hutchinson, agt.; Morgan, La. and Texas R. R. and Steamship Co., per A. C. Hutchinson, presdt.

We concur in the above: Texas and Pacific Ry. Co., E. B. Wheelock, genl. agt.; F. C. Shephard, genl. agt. Louisville and Nashville Railroad.

The Senate and House of Representatives of the United States.

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6. EXTENSION OF THE RAILROAD SYSTEM OF SOUTH FLORIDA TO CANAVERAL.

Memorandum of Mr. Henry H. Harrison.

AUGUST 13, 1892.

The Jacksonville, St. Augustine and Halifax River Railroad is now building to Rockledge, within 12 miles of Canaveral, and will be completed by January 1, 1893. It will be extended in time to Biscayne Bay.

The Jacksonville, Tampa and Key West Railway system terminates at Titusville, 25 miles from Canaveral. A charter has been granted to an allied company to build a railroad from Titusville to Cape Florida, with branches to Canaveral and New Smyrna.

The Canaveral and South Florida Railroad Company has been chartered to build a railroad from Kissimmee to Canaveral, a distance of 55 miles. Twelve miles of this have already been built by the Sugar Belt Railway Company. The Canaveral and South Florida Railroad Company is backed by strong capitalists and railroad men of New York, Philadelphia, and Chicago, and is ready to go ahead and build its road as soon as Congress makes an appropriation for the Canaveral breakwater.

This railroad will connect at Kissimmee with the South Florida Railway and the Kissimmee River. It has made arrangements with the Florida Midland Railway to use its track, and will thus connect with the Florida Midland at Kissimmee, with the Orange Belt Railway at Clarkona, and with the Florida Central and Peninsular Railway system at Apopka.

It will thus bisect every important railroad in south Florida and offer all of them a shorter and cheaper outlet, quicker time, and lower rates than are possible by any existing route to the great Eastern distributing markets.

I am authorized by the directors of this railroad company to say that the road will be built as soon as an appropriation is made for the breakwater.

The consensus of opinion among south Florida producers and shippers is that at least one-third of the fruit and trucks will go out via Canaveral, and that the other two-thirds will be benefited in two ways, viz:

First. The competition of Canaveral will reduce the present exorbitant rates via Jacksonville, etc.; and

Second. The same competition will increase the facilities for handling perishable freights and cause a better service, and will prevent the heavy losses now experienced every busy season from the overcrowding of the existing line.

TRAFFIC OF INDIAN RIVER, HALIFAX RIVER, ETC.

Memorandum of Mr. Henry H. Harrison.

A statement by the tax assessor of Brevard County is submitted herewith. It shows that the fruits and trucks shipped the past year amounted in value to $529,963 at home. The imports of goods and building material were worth as much as the exports or probably more.

The business of Dade County was also large, but I have not yet obtained the figures.

I have applied for a statement of the business done by the Indian R
of the J., T. & K. W. Railway, the South Florida Railway, the A. & W.
the Halifax division of the J., St. A. & H. R. R. R., as all this business wi
averal as soon as the port is opened. These statements have not yet be
They will be submitted upon arrival.

An estimate of the effect of the opening of the port of Canaveral
made.

The orange crop of Florida last year was some 3,600,000 boxes. Its
and trucks were equal to about 3,600,000 crates.

The rate on oranges from Havana, Cuba, to New York is 25 cents per
Jacksonville to New York, 40 cents; from Kissimmee, 72 cents; from R
cents. Five lines of steamers between the Gulf ports and New York pa
within sight of Canaveral, and will call there both ways as soon as the
is built. They have agreed to give the same rate from Canaveral as fr
viz, 25 cents per box. The Canaveral and South Florida Railroad will
of 10 cents per box from Rockledge and Kissimmee, saving 45 cents p
Rockledge and 37 cents from Kissimmee.

The first effect of the opening of the Canaveral route will be to redu
from Jacksonville to New York from 40 cents to 25 cents.

If, therefore, one-third of the fruits and trucks go out via Canaveral,
boxes, at an average reduction in freight of 30 cents per box, the sh
$720,000 per annum, and the reduction of 15 cents per box on the remaini
boxes which go East via Jacksonville, etc., saves them $540,000 more—
It must also be remembered, as stated by the president of the New Yor
change, that the losses sustained at present from unnecessary delays in
tion cost the shippers as much as the whole amount of the freight bil
most of this would be avoided if the direct Canaveral route was opened.

Another important consideration is, that in view of the gluts in the No
kets, the Florida shippers have been trying to build up a direct export of
England and Europe generally. Shipments are made at present via
which involves too much delay and expense. It is proposed to run specia
from Jacksonville; but these would be small, and only sail at intervals.

The Jacksonville auction-house market, which has charge of this ma
that Canaveral is the best port for this export of oranges.

As soon as Canaveral is opened it will be the coaling outport from Ne
etc., and the one hundred and fifty steamers engaged in the Gulf cotton
call there almost daily, affording (with the phosphate steamers also)
direct communication with England, France, and Germany, and a rate not
40 cents per box. This is a matter of vast importance to Florida.

Besides these savings on exports, it must be remembered that most of
consumed in south Florida come from New York.

With Canaveral open, the people of south Florida will get their goods
home for what it costs now to land them in Savannah or Jacksonville, a
the exorbitant charges on the present long overland haul will be saved to

The number of young orange trees returned by the assessor in Brevard
more than double the number of bearing trees. The area of new pineapp
tion is at least five times that of those in bearing. It is therefore evident
short time the exports will be three times as much as at present.

The increase in the production of trucks under favorable conditions can
estimated. Not over 1 per cent of Brevard County is now in cultivatio
Production is discouraged and limited by high freights and heavy losses f
in transit. If the port of Canaveral is opened, time and freights will b
one-half, profits will be largely increased, and production will be greatly st
South Florida depends entirely upon agriculture; it has neither manufa
commerce. At present agriculture is unprofitable for want of cheap and ra
portation. Give water transportation to New York, and a great increase o
tion will follow. If Brevard and Dade counties alone, to say nothing of
Polk, etc., now export fruits and trucks worth about $1,000,000 at home w
1 per cent of their soil in cultivation, what will be the value of their expor
per cent in cultivation? Such a development will follow cheap transporta
it is impossible while they are confined to the present circuitous and expen
land routes. It should be remembered that one acre in Florida in oran
apples, cabbages, etc., yields nearly a carload of freight, or as much as 2
Western wheat.

Respectfully submitted.

HENRY H. HA

STATEMENT BY THE TAX ASSESSOR OF BREVARD COUNTY, FLA.

The list given below is not complete, but covers more than 95 per cent of the productions of the county for the year ending July 1, 1892:

Name of product.	Acres.	Bushels.	Valu
Corn	141	1,745	$1,062
Oats	13	190	165
Sweet potatoes	59	7,411	5,889
Rice	4	105	108
Field pease	54½	650	775
Peanuts	1	20	39
Irish potatoes	18½	1,153	2,234
Peaches, 205 trees		152	306
Sugar cane, 42 acres, 397 barrels sirup			7,260
Hay, 28 acres, 88 tons			600
Tobacco, half acre, 904 pounds			165
Honey, 517 hives bees, 34,340 pounds			2,821
Cabbage, 67 acres, 8,302 barrels			7,744
Squashes, ½ acre, 84 barrels			170
Egg plant, ½ acre, 30 barrels			35
Grape fruit, 132 trees, 50 barrels			167
Oranges, 99,486 bearing trees, 165,532 boxes			293,330
201,611 nonbearing trees			
Lemons, bearing trees 1,697, 17,343 boxes			3,155
21,951 nonbearing trees			
Limes, 646 trees, 343 boxes			486
Pineapples, 2,268,850 apples			144,865
Bananas, 17,502 bunches			10,368
Cocoanuts, 631 trees, 560 nuts			56
Tomatoes, 154 acres, 16,406 boxes			27,367
Cucumbers, 1 acre, 60 crates			300
Beans, 166 acres, 19,679 crates			39,865
Strawberries, 1½ acres, 1,000 quarts			300
Grapes, 2½ acres			800
Wine, 500 gallons			500
Horses, 165			16,350
Mules, 66			6,615
Stock cattle, 699			36,535
Hogs, 1,384			1,390
Chickens, 3,679			1,757
Ducks, 67			72
Turkeys, 144			174
Eggs, 3,644 dozen			7,601
Milch cows, 262			4,930
Milk, 40,810 gallons			13,354
Butter, 5,110 pounds			1,570

d. RESOLUTION OF CHAMBER OF COMMERCE AND INDUSTRY OF LOUISIANA.

At a meeting of the Chamber of Commerce and Industry of Louisiana, held at the rooms of the chamber, Nos. 120 and 122 Common street, at 8 p. m., on Thursday, June 23, 1892, the following preamble and resolution were unanimously adopted:

Whereas, in the opinion of this chamber, it is one of the important duties of this Government to provide, at all needed places, ports of refuge, whereby life may be preserved and loss of property avoided; and

Whereas there is no port or other place of refuge for large vessels on the coast of Florida for many hundreds of miles south of Fernandina, practically until Key West be reached, in consequence whereof a great danger to all the commerce of these seas exists; therefore, be it

Resolved, That this chamber respectfully urges upon the Government of the United States the importance to navigation and commerce of constructing a national harbor of refuge in the Bight of Canaveral, according to the prayer of the memorial of the State of Florida and the recommendation of the Navy Department.

[SEAL.]

ROBERT BLEAKLEY,
Secretary.

RESOLUTION OF BOARD OF UNDERWRITERS.

OFFICE OF BOARD OF UNDERWRITERS,
No. 136 Gravier Street, New Orleans, June 21, 1892.

Whereas, in the opinion of this body, it is one of the important duties of this Government to provide, at all needed places, ports of refuge, whereby life may be preserved and loss of property avoided; and

Whereas there is no port or other place of refuge for large vessels on the coast of Florida for many hundreds of miles south of Fernandina, practically until Key West be reached, in consequence whereof a great danger to all the commerce of these seas exists; therefore, be it

Resolved, That this body respectfully urges upon the Government of the United States the importance to navigation and commerce of constructing a national harbor of refuge in the Bight of Canaveral, according to the prayer of the memorial of the State of Florida and the recommendation of the Navy Department.

L. M. FINLEY, *V. P.*

GEORGE MATHER,
Secretary.

RESOLUTIONS OF NEW ORLEANS BOARD OF TRADE.

NEW ORLEANS BOARD OF TRADE, LIMITED,
New Orleans, June 21, 1892.

The following resolutions were to-day favorably considered by the president and executive committee of the New Orleans Board of Trade, limited:

Whereas, in the opinion of this body, it is one of the important duties of this Government to provide, at all needed places, ports of refuge, whereby life may be preserved and loss of property may be avoided; and

Whereas, there is no port or other place of refuge for large vessels on the coast of Florida for many hundreds of miles south of Fernandina, practically until Key West be reached, in consequence whereof a great danger to all the commerce of these seas exists; therefore, be it

Resolved, That this body respectfully urges upon the Government of the United States the importance to navigation and commerce of constructing a national harbor of refuge in the Bight of Canaveral, according to the prayer of the memorial of the State of Florida, and the recommendation of the Navy Department.

F. J. ODENDAHL,
President.

[SEAL.]

HY. H. SMITH,
Secretary.

APPENDIX P.

IMPROVEMENT OF RIVERS AND HARBORS IN WESTERN GEORGIA AND FLORIDA AND IN EASTERN ALABAMA.

REPORT OF CAPT. PHILIP M. PRICE, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1893, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Apalachicola Bay, Florida.
2. Apalachicola River, the Cut-off, and Lower Chipola River, Florida.
3. Flint River, Georgia.
4. Chattahoochee River, Georgia and Alabama.
5. La Grange Bayou and Holmes River, Florida.
6. Choctawhatchee River, Florida and Alabama.
7. Harbor at Pensacola, Florida.
8. Escambia and Conecuh rivers, Florida and Alabama.
9. Alabama River, Alabama.
10. Tallapoosa River, Alabama.
11. Coosa River, Georgia and Alabama.
12. Operating and care of canals and other works of navigation on Coosa River, Georgia and Alabama.
13. Cahaba River, Alabama.

EXAMINATIONS.

4. Bar at mouth of Alaqua Bayou, Florida.
15. Bar at junction of Choctawhatchee Bay and Santa Rosa Sound, Florida.

UNITED STATES ENGINEER OFFICE,
Montgomery, Ala., July 10, 1893.

GENERAL: I have the honor to transmit herewith the following an-ial reports.

* * * * * * *

Very respectfully, your obedient servant,

PHILIP M. PRICE,
Captain, Corps of Engineers.

ig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. Army.

P 1.

IMPROVEMENT OF APALACHICOLA BAY, FLORIDA.

PLAN OF IMPROVEMENT.

The report of the examination of Apalachicola Bay, Florida, is printed in the report of the Chief of Engineers for 1879, page 823. The minimum depth of water over the bar at the mouth of Apalachicola River was then 3½ feet.

In accordance with the recommendations therein a project was approved that contemplated the dredging of a straight channel through the bar at the mouth of the river to a depth of 11 feet and a width of 100 feet, to be afterwards increased to 200 feet should the first cut produce results to warrant it, at an estimated cost of $100,000.

A survey of the mouth of the Apalachicola River and a portion of Apalachicola Bay was made in 1891 by Assistant Engineer Thomas Robinson, and the report thereon was submitted by me on May 15, 1891.

In accordance with the recommendations of this report the present project was approved, viz, to dredge a channel through the bar at the mouth of the Apalachicola River to a depth of 11 feet, with a width of 100 feet, to be afterwards increased to 200 feet should the first cut produce results to warrant it; and a channel through Bulkhead Shoal 9 feet deep and not less than 100 feet wide.

The commerce of Apalachicola Bay consists principally in the exportation of lumber. Ships generally enter through East Pass, between St. George and Dog Islands, and anchor under the shelter of these islands, about 24 miles from the town of Apalachicola. The lumber is carried on lighters, towed by tugs drawing from 5 to 7 feet, from Apalachicola to the anchorage grounds, and there loaded on ships for export. The natural channel to the anchorage grounds is no where less than 9 feet in depth, except at the bar at the mouth of the Apalachicola River and at Bulkhead Shoal. It is believed that the 9-foot channel dredged through Bulkhead Shoal in 1891–'92 will be reasonably permanent. Experience shows that the bar at the mouth of the Apalachicola River, which is composed of sediment brought down by the river, will require redredging at least every two years in order to maintain a channel of sufficient depth to accommodate the commerce, unless the dredged channel be made wider and deeper than the appropriations have hitherto permitted. In this case redredging might be required less frequently.

APPROPRIATIONS.

March 2, 1833	$8,700	August 5, 1886	$12,000
July 4, 1836	10,000	August 11, 1888	20,000
March 3, 1839	9,900	September 19, 1890	20,000
July 14, 1880	10,000	July 13, 1892	20,000
March 3, 1881	10,000		
August 2, 1882	25,000	Total	155,600
July 5, 1884	10,000		

OPERATIONS TO JUNE 30, 1892.

The bar at the mouth of the Apalachicola River is about 7,300 feet in width between the 8-foot curves. A straight channel has been dredged across this bar from time to time, since 1881, as funds have been available. The dredged cut has never exceeded 90 feet in width and 9½ feet in depth, and has gradually filled up with sediment after each dredging. In February, 1892, the dredging of a straight channel about 4,000 feet long, 120 feet wide, and 9 feet deep, across Bulkhead Shoal, was completed.

WORK DONE DURING PAST FISCAL YEAR.

Assistant Engineer Thomas Robinson, in local charge of the work, reports as follows:

Under contract with Rittenhouse Moore, at $0.33 per cubic yard, dredging along the lines of the old channel at the mouth of the Apalachicola River was begun in November, 1892, and completed, so far as the appropriation allowed, in April, 1893. In this work 55,126 cubic yards of mud and sand were removed, making a channel of 8 feet depth, and varying in width from 120 feet at its inner, to 100 feet at its outer end for a distance of 5,350 feet over the main bar; and a cut 250 feet long, 70 feet wide, and 8 feet deep through a small isolated bar of hard sand above the inshore end of the long channel.

On June 30, 1893, the channel has not materially changed since the cessation of dredging, and the commerce of the port suffers but little inconvenience. The process of shoaling, however, is going on constantly, and in less than two years the water over the bar will probably have a less depth than 5 feet at low water.

The channel through the Bulkhead Shoal is good. No deposit is perceptible, and this part of the improvement is apparently complete and permanent.

To maintain the commerce of the port of Apalachicola, dredging must be done annually, or at least as often as once in two years; and from experience of the past, 60,000 or 70,000 cubic yards of deposit must be removed at each cutting in order to secure a channel of 100 feet wide by 8 feet deep across the bar. A channel of greater dimensions would be more durable and economical; but so long as the improvement is confined to dredging alone the work will not be permanent. I am of the opinion that a simple dam or training wall, 5,000 feet long, on the east side of the river mouth, from the beacon, on the marsh, down to and across North and Crooked channels to the Tow Head, would greatly retard the filling in of the channel. (See small map in Annual Report of Chief of Engineers, for 1890, p. 1624). My reasons for this statement are, briefly, that the stream now divides, and uniting down in the bay forms cross-currents, slackwater, and deposits silt. North of Apalachicola is Lake Wimlico, an expanse of fresh water affected by tides; the dam suggested would control the ebb and flow of this tidal basin and make it combine with the current of the river to scour out the deposit at its mouth. Much of the space to be covered by the proposed dam is over shallow water, not over a foot, and sometimes less, in depth at low tide. The water is fresh and muddy, and unfavorable to teredo life. Common piles, 1 foot by 20 feet driven 15 feet, close enough to form sheet piling, would answer, at an estimated cost of $20,000.

RECOMMENDATIONS AND ESTIMATES.

The preservation of a passable channel through the bar at the mouth of the Apalachicola River is essential to the carrying on of the very considerable commerce of the port of Apalachicola. Experience has shown that the removal, at least once in two years, of from 60,000 to 70,000 cubic yards of deposit is required in order to secure a channel 100 feet wide by 8 feet deep, and that a deeper channel would probably be more durable, and an estimate of $50,000 is therefore submitted as the amount that can be profitably expended during the fiscal year ending June 30, 1895.

Money statement.

July 1, 1892, balance unexpended	$48.93
Amount appropriated by act approved July 13, 1892	20,000.00
	20,048.93
June 30, 1893, amount expended during fiscal year	19,877.29
July 1, 1893, balance unexpended	171.64
Amount that can be profitably expended in fiscal year ending June 30, 1895 Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	50,000.00

Abstract of bids received and opened on September 20, 1892, by Capt. Philip M. Price, Corps of Engineers, for dredging in Apalachicola Bay, Florida.

No.	Name and address of bidder.	Time of commencement.	Time of completion.	Price per cubic yard.
1	Rittenhouse Moore, Mobile, Ala	Dec. 20, 1892	June 30, 1893	$0.23

COMMERCIAL STATISTICS.

[Furnished by the collector of customs.]

	No.	Tonnage.
		Tons.
Vessels entered	142	66, 683
Vessels cleared	153	71, 575

Number of vessels employed in the traffic of Apalachicola, Fla	160
Amount of superficial feet of timber and lumber exported	60, 238, 900
Estimated number of vessels and river steamers arrived and departed.	700
Estimated tonnage of above vessels	88, 150
Value of exports to foreign ports	$392, 389. 00
Value of exports to coastwise ports	381, 000. 00
Total value of exports	773, 389. 00
Value of imports from foreign countries	156. 45
Value of imports from coastwise ports	250, 000. 00
Total value of imports	250, 156. 45
Total value of imports and exports	1, 023, 545. 45
Estimated value of exports and imports to or from coastwise ports by sail vessels and river steamers which do not enter or clear from the custom-house:	
Exports	1, 125, 000. 00
Imports	1, 450, 000. 00

There are six sawmills here, which can turn out 350 M superficial feet of lumber a day, with shingle attachments, which turn out 250 M shingles per day; three oyster-canning factories, with a capacity of 60,000 cans per day; one fish-packing establishment, which packs about 6,000 barrels of salted and pickled fish per annum; one ice factory, manufacturing 7 tons per day.

All the above enterprises expect to double the amount of business during the next fiscal year, as the supply of timber leading to this port and other commodities are inexhaustible.

Very respectfully,

WM. B. SHEPPARD,
Collector.

CUSTOM-HOUSE, *Apalachicola, Fla., July 3, 1893.*

P 2.

IMPROVEMENT OF APALACHICOLA RIVER, THE CUT-OFF, AND LOWER CHIPOLA RIVER, FLORIDA.

PLAN OF IMPROVEMENT.

The report of the examination and survey of the Apalachicola River is printed in the Report of the Chief of Engineers for 1873, p. 698.

The Apalachicola River is formed by the junction of the Chattahoochee and Flint rivers, and is about 105 miles long from the junction to Apalachicola Bay. The channel is nowhere less than 6 feet deep, but is more or less obstructed after each freshet in the Chattahoochee and Flint rivers, by logs and snags brought down by those rivers, and by trees which have fallen from its own heavily-timbered banks.

At Moccasin Slough and at the Upper and Lower Elbows the channel is very narrow and crooked and difficult to navigate, and needs straightening and widening.

The act of August 11, 1888, directed an examination of the Chipola River, Lee Slough, and the cut-off. The report of this examination is printed in the Annual Report of the Chief of Engineers for 1889, p. 1416.

The act of September 19, 1890, appropriated $2,000 for maintaining the existing works on the Apalachicola River, including Lee Slough. The original project was modified accordingly, and now provides for securing a channel 100 feet wide and 6 feet deep at low water in the Apalachicola River, by the removal of snags and overhanging trees and widening and straightening Moccasin Slough and the Elbows, and for securing a channel through the cut-off, Lee Slough, and the Lower Chipola River, 60 feet wide and 5 feet deep at low water, by the removal of logs and snags and overhanging trees. The estimated cost of completing the original project was $80,333, and of the improvement of the cut-off, Lee Slough, and the Lower Chipola River, $7,500.

APPROPRIATIONS.

May 23, 1828	$3,000
April 23, 1830	2,000
March 2, 1831	8,000
June 23, 1874	10,000
March 3, 1875	10,000
June 18, 1878	8,000
March 3, 1879	5,000
June 14, 1880	2,000
March 3, 1881	1,500
August 2, 1882	$2,000
July 5, 1884	1,000
August 5, 1886	1,000
August 11, 1888	2,000
September 19, 1890	2,000
July 13, 1892	5,000
Total	62,500

OPERATIONS TO JUNE 30, 1892.

Between 1874 and 1880 the accumulation of logs and snags was removed from the channel of the Apalachicola River, and a partial improvement was made at Moccasin Slough and the Elbows. Since 1880 the appropriations have only sufficed to remove the snags and logs annually brought down by the freshets in the rivers above. There is no plant belonging to this river, and the annual snagging work was done by the Chattahoochee River's snag boat at times when the water in the latter river was too high for channel work.

During the winter of 1891-'92 a large amount of drift and obstructing timber was removed from the cut-off, which enabled the river steamers to run to Wewahitchka, Fla., and greatly facilitated the shipment of the orange and other crops from that flourishing neighborhood.

WORK DONE DURING THE PAST FISCAL YEAR.

Assistant Engineer Thomas Robinson, who has been in local charge of the work, reports as follows:

> In January, 1893, the snag boats *Chattahoochee* and *Flint*, having been taken from work in the upper rivers on account of the winter rains, were loaned to this improvement. In the prosecution of the work there were removed from the Apalachi-

cola River 52 snags and logs and 708 overhanging trees; from the lower Chipola River, 13 snags and logs, 75 overhanging trees, and 52 stumps; from the cut-off, 150 snags and logs, 2,832 overhanging trees, 61 stumps, and 403 bushes; and from Lee Slough, 3,028 snags and logs, 1,218 stumps, 4,452 overhanging trees, and 2,528 bushes.

For about one mile of the distance through Lee Slough the channel was widened. This was accomplished by cutting off the trees, loosening the ground by dynamite, and pulling the stumps, thus allowing the current to wash away the soil. In some cases, after the stumps were pulled, plowing was done to help the erosion.

At the present writing the channel of the Apalachicola River is fairly free from obstructions, except those that are due to the sharp bends at the Elbows and Moccasin Slough.

The cut-off and lower Chipola River (including Lee Slough) are now open, and if carefully handled the steamboats can come through this waterway on the upstream passage; but the downstream run is a tedious and dangerous one.

Under the approved project the improvement of the main channel of the Apalachicola River may be considered nearly complete, while that of the Cut-Off and the lower Chipola River (including Lee Slough) is only about half done, and until this part of the work is finished the practical end designed by the improvement remains unattained.

It is recommended that an appropriation be made to complete this improvement in one season, and render available at once the work already done. For the completion of the work no new plant is needed, but, as before, the snagboats of the Chattahoochee or Flint rivers, or both, can be utilized when otherwise lying idle during the winter high water.

ESTIMATES.

For the maintenance of the work as it now is	$2,000
To complete opening of lower Chipola River	5,000
To make improvements at the Elbows and Moccasin Slough	4,000
Total	11,000

All of which can be profitably expended during the fiscal year ending June 30, 1895.

RECOMMENDATIONS AND ESTIMATES.

It is estimated that $2,000 will be required for the annual snagging operations on the Apalachicola River proper; that the improvements needed at the Elbows and Moccasin Slough can be completed for $4,000, and that the opening of a practicable steamboat channel (for passage in both directions) can be completed through the cut-off and the lower Chipola River for $5,000 by using the Chattahoochee and Flint River snag boats at times when they are not employed on those rivers, respectively, on account of high water.

The country contiguous to these waterways is entirely dependent upon them for transportation, and it is very important that the many steamboats engaged in commerce upon them should be able to make their trips with regularity and safety.

It is therefore respectfully recommended that the entire amount asked for above be made in one appropriation.

The cut-off is a navigable waterway about 3 miles long, connecting the Apalachicola River with the lower Chipola River near the Dead Lakes. The Chipola River empties into the Apalachicola River about 14 miles below its junction with the cut-off. "Lee Slough" is simply a local name for a portion of the lower Chipola River, about 3 miles long. (See map at p. 1697 of the Annual Report of the Chief of Engineers for 1891.) It is therefore recommended that the wording of the new appropriation be changed from "Apalachicola River, including Lee Slough," to "Apalachicola River, including the cut-off and lower Chipola River," in order that the work required to be done may be correctly designated.

Money statement.

mount appropriated by act approved July 13, 1892	$5,000.00
une 30, 1893, amount expended during fiscal year	5,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	11,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

COMMERCIAL STATISTICS.

The lines of steamboats on the Chattahoochee and lower Flint rivers also run on this river, the regular trips of each of the boats being from Columbus, Ga., on the Chattahoochee River, to Bainbridge, Ga., on the Flint River, thence to Apalachicola, Fla., at the mouth of the Apalachicola River, and return by the same route.

When the improvement of the cut-off and lower Chipola River is completed, the boats will generally run by this route, as there are many landings, offering a large business, along it, while there is very little business to be done on the main river between the cut-off and the mouth of the Chipola River.

It is not possible to state the amount of business done on the Apalachicola River separately from that done on the Chattahoochee River, but in general terms it may be stated to be the same.

Reference is therefore made to the report on the Chattahoochee River for commercial statistics.

P 3.

IMPROVEMENT OF FLINT RIVER, GEORGIA.

PLAN OF IMPROVEMENT.

The present plan of improvement was adopted in accordance with the recommendations contained in the reports of examinations and surveys of the Flint River, printed in the Annual Reports of the Chief of Engineers of 1873, p. 707; and 1879, p. 818.

The project provides for a low-water channel 3 feet deep and 100 feet wide from the junction with the Chattahoochee River to Albany, Ga., an estimated distance of 105 miles; and for a navigable channel for light-draft steamers, at moderate stages of water, from Albany to Montezuma, Ga., an estimated distance of 77 miles; to be secured by the removal of snags and overhanging trees, cutting through the rock reefs, and deepening sand bars by works of contraction and shore protection.

Below Albany the work consists principally in excavating the required channel through the rock bottom of the river, and the improvement effected is of a permanent character. The few snags and logs brought down by the winter freshets must, however, be removed annually.

From Albany to Warwick, 38 miles above, low-water navigation is prevented by a series of rock shoals, on which the low-water depth is from 6 to 18 inches. Between Warwick and Montezuma the improvement consists mainly in the removal of snags and logs and overhanging trees.

Experience in working on the river above Albany has shown that a practicable and useful navigation of this section of the river, at moderate stages of water, can probably be secured only by providing slack-water navigation by dams and locks, and that the work now being done is of no commercial benefit. Two bridges, without draw openings, at distances respectively of 16 and 41 miles above Albany, now prohibit steamboat navigation at the higher stages of water; but no proceeding have been instituted to compel the insertion of draw spans in the bridges, for the reason that no complaint has been made against them. and there appears to be no desire to operate a steamboat on this sect of the river.

APPROPRIATIONS.

For the Chattahoochee and Flint rivers:	
June 23, 1874	$25,000
March 3, 1875	25,000
August 14, 1876	20,000
	*70,000
June 18, 1878	10,000
March 3, 1879	7,000
June 14, 1880	20,000
March 3, 1881	15,000
For the Chattahoochee and Flint rivers—Continued.	
August 2, 1882	$25,000
July 5, 1884	20,000
August 5, 1886	20,000
August 11, 1888	2[illegible]
September 19, 1890	20,000
July 13, 1892	15,000
Total	172,000

OPERATIONS TO JUNE 30, 1892.

A moderately efficient working plant had been provided for r excavation below Albany, Ga., and for snagging operations ab Albany.

Below Albany.—Some loose rock excavation had been done at all t rock shoals between Albany and Bainbridge, the excavated mate being disposed of in spur dams. There was a completed and per nent channel from Albany to Luckie Island, a distance of 22 mi Between Luckie Island and Bainbridge, a distance of 47 miles, t channel was passable, with care, at moderate stages of water, but at low water was in many places impracticable. Between Bainbridge a the mouth of the river, an estimated distance of 36 miles, the river w navigable throughout the year and required but little improveme except to clear out the fresh logs and snags brought in by the wint floods.

Above Albany.—Snags and other drift and overhanging trees ha been removed from the channel from time to time between Albany a Montezuma, and some of the loose bowlders had been removed fro the channel between Albany and Warwick.

WORK DONE DURING PAST FISCAL YEAR.

Assistant Engineer Thomas Robinson, who has been in local char of the improvement, reports as follows:

> *Above Albany.*—During the fiscal year ending June 30, 1893, no channel work done between Albany and Montezuma.
>
> The snag boat *Flint*, which has heretofore worked on this part of the river, has b under repair, in preparation for stern-wheel machinery, and as soon as the repa are completed the boat will resume work.
>
> No attempt at steamboat navigation has been made on this section of the riv and consequently commerce has suffered no hindrance from the unimproved co tion of the river. There appears to be little or no demand for the navigation of t Flint River between Albany and Montezuma, and until some commercial dema arises, it seems inexpedient to recommend any further appropriation.
>
> *Below Albany* the process of straightening and widening the channel through t rock shoals, by blasting of ledges and removal of loose rocks and depositing the sa to form training dams, where necessary, was begun at Luckie Island and carried through 5 miles of river to the lower end of Ferguson Shoals. Below Bainbr

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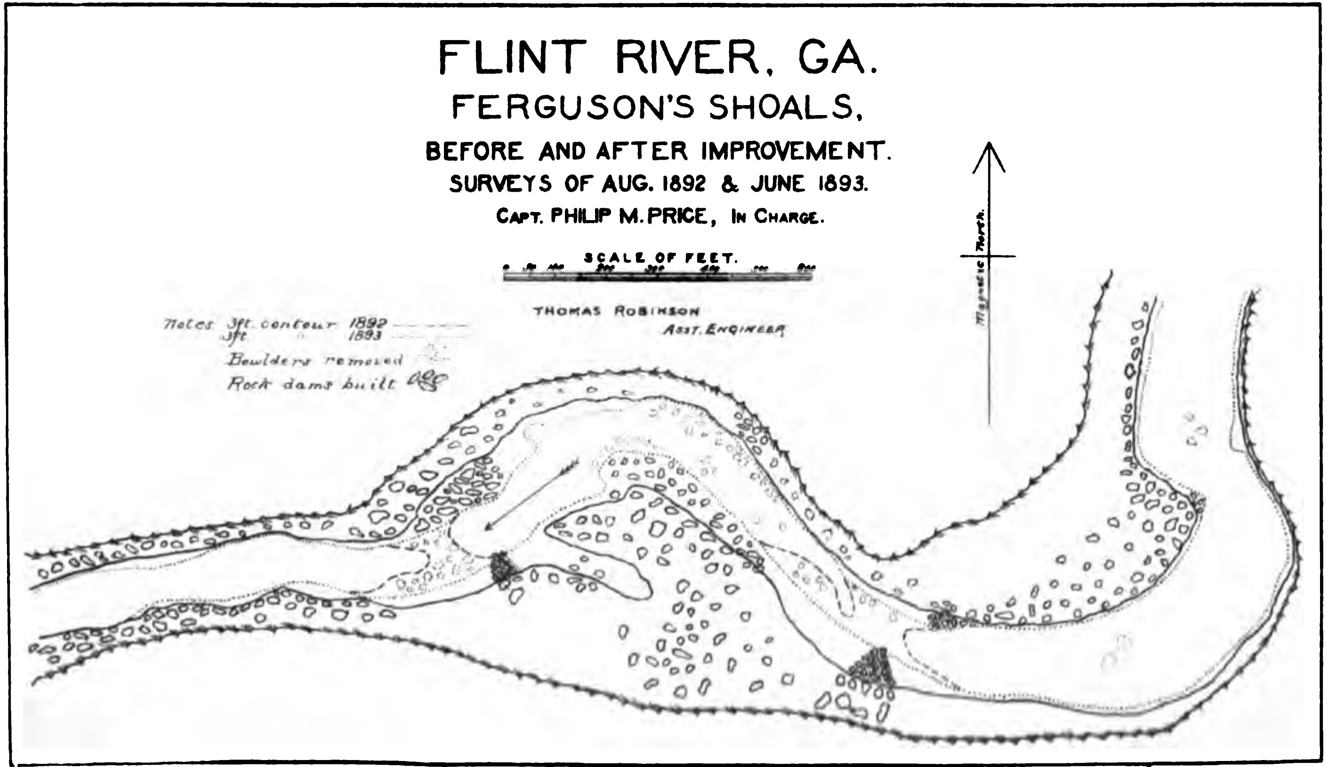
* Of this amount $18,000 was expended on the Flint River.



FLINT RIVER, GA.

FERGUSON'S SHOALS,

BEFORE AND AFTER IMPROVEMENT.

SURVEYS OF AUG. 1892 & JUNE 1893.
CAPT. PHILIP M. PRICE, IN CHARGE.

To accompany Annual Report for 1893

nothing was done but the removal of a few snags by the snag boat *Chattahoochee*. The work involved the clearance of 255 overhanging trees from the banks; the removal of 89 snags and 2,440 cubic yards of rock from the stream, and the construction of 177 linear feet of training dams. (A map of Ferguson Shoals is hereto appended.) The work thus done leaves the channel complete and permanent in accordance with the project, for a distance of 25 miles below Albany. For a further distance of 44 miles to Bainbridge, rock shoals render the channel impassable at low water, and until these are fully cleared, the utility of the work already done is limited to seasons of moderate high water.

A small steamboat was run between Albany and Bainbridge for a part of the year, but owing to the rock impediments at low stages of the river, which prevented navigation for several months, the owners of the boat became discouraged and sold the craft to parties at Apalachicola, Fla. It appears that a considerable commerce would be done on the Flint River between Albany and Bainbridge provided the channel were clear, and it is recommended that further appropriations be made to finish the work in accordance with the approved project.

RECOMMENDATIONS AND ESTIMATES.

It is useless to continue the improvement of the river above Albany for commercial purposes unless the bridges above mentioned are provided with draw openings, and it seems to be an unnecessary hardship to compel the owners of the bridges to provide draw openings to accommodate a commerce which does not now exist, and of which there is no immediate prospect.

For this reason, and on account of the improbability of being able to secure a satisfactory navigation without the construction of locks and dams, at a cost entirely incommensurate with any prospective commerce to be developed thereby, it is recommended that no further allotments be made, for the present at least, for the improvement of the Flint River above Albany, but that the whole appropriation be expended in continuing the useful and important work below Albany.

Money statement.

July 1, 1892, balance unexpended	$4,728.43
Amount appropriated by act approved July 13, 1892	15,000.00
	19,728.43
June 30, 1893, amount expended during fiscal year	10,121.60
July 1, 1893, balance unexpended	9,606.83
July 1, 1893, outstanding liabilities	1,004.44
July 1, 1893, balance available	8,602.39
Amount that can be profitably expended below Albany in fiscal year ending June 30, 1895	38,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

COMMERCIAL STATISTICS.

Assistant Engineer Thomas Robinson, in local charge of the improvement, reports as follows:

Between Albany and Montezuma.—None. There has been no commercial navigation of this section of the river.

Below Albany.—Between Albany and Bainbridge there is no commercial navigation at present, owing to the rock obstructions. The steamboat which formerly ran between these points could not run at low water, and its owners sold it to other parties. The boat is now being rebuilt at Apalachicola, Fla., and when completed the present owners design to run it between Albany, Ga., and Apalachicola, Fla., when the stage of water permits.

Below Bainbridge the steamboats which run on the Chattahooche and Apalachicola rivers also run on this portion of the Flint River, going to Bainbridge on almost every regular trip. It is therefore impossible to state the amount of busines on this portion of the river separate from that done on the Apalachicola and Ch hooche rivers, but in general terms it may be said to be the same. For comm statistics reference is made to the report on the Chattahoochee River.

P 4.

IMPROVEMENT OF CHATTAHOOCHEE RIVER, GEORGIA AND ALABAM

GENERAL IMPROVEMENT.

Plan of improvement.—The present plan of improvement was adopt in accordance with the recommendations contained in the reports examinations and surveys of the river, printed in the Annual Report the Chief of Engineers for 1872, p. 584, and 1873, p. 699.

The project provides for a low-water channel 4 feet deep and 100 f wide, from Columbus, Ga., to Chattahoochee, Fla., an estimated d tance of 224 miles, by the removal of snags and logs from the chan and overhanging trees from the banks, cutting a channel through rock shoals, and deepening sand bars by works of contraction shore protection.

The improvement, at many points, is of a permanent character, bottom of the river being of rock and the banks not easily eroded; a few points the obstructions consist of shifting sand bars and cav banks. Each freshet brings a considerable number of logs and sn into the channel, which must be removed annually.

In addition to such amounts as may be appropriated for contin the improvement of the river, an annual expenditure, estimated $10,000, will be required for the maintenance of a stern-wheel s boat, and for the repair of works of contraction and shore protectio

APPROPRIATIONS.

February 24, 1835	$2,000
Chattahoochee and Flint rivers:	
June 23, 1874	25,000
March 3, 1875	25,000
August 14, 1876	20,000
	*70,000
June 18, 1878	18,000
March 3, 1879	15,000
June 4, 1880	[illegible]
March 3, 1881	[illegible]
August 2, 1882	[illegible]
July 5, 1884	[illegible]
August 5, 1886	[illegible]
August 11, 1888	[illegible]
September 19, 1890	[illegible]
July 13, 1892	†[illegible]
Total	21[illegible]

OPERATIONS TO JUNE 30, 1892.

A stern-wheel snag boat had been built and maintained for snag operations, with which the channel had been kept clear of obstruct of that character, except during limited periods, when funds were available. A moderately efficient working plant had also been m tained for operations upon the rock shoals and for contraction wo Works of contraction had been constructed to a limited extent. with the funds available it had not been practicable to keep the repair nor to extend nor modify them as required.

Navigation had been greatly benefited by the incomplete impr ments, so that steamboats then made regular trips between Colum Ga., and Apalachicola, Fla., running by night as well as by day, few detentions, except at extreme low water. Formerly they only run by day and were frequently detained at the shoal bars for days at a time, and many boats were sunk by striking obstructions.

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*Of the joint appropriations, $52,000 was expended on the Chattahoochee Riv

†Of which $5,000 were to be expended between West Point and Franklin.

WORK DONE DURING PAST FISCAL YEAR.

Assistant Engineer Thomas Robinson, who has been in local charge of the work, reports as follows:

Under the new appropriation work was resumed in August, 1892, by fitting out the snag boat to remove the scattered logs, etc. This clearance of drift from the main channel was completed by the first of October, and work by both snag boat and pile-driver barge was then resumed at Mound Bar, 7 miles below Columbus, Ga. The improvement of this bar consisted of plowing out a new channel along the axis of the high-water run and confining the low-water flow to it by a series of longitudinal and transverse dams and by building protections for the foot of the caving bank on the left or eroding side of the stream. The dams were pile and brush structures. The piles were driven in either two or three rows, according to the strength required, and the brush fascines were held in place between the piles by a layer of rock ballast upon the first course and by wire fastenings for the upper courses. The tops of the piles were stayed by cross braces and wales, bolted on after the brush was laid.

The shore protections consisted of a series of brush beds, weighted down by gravel ballast. The under layer of each bed, by the use of small poles and wires, was woven into a sort of mat; upon this a layer of gravel was shoveled and over this was placed another layer of brush, fastened to the former with cross poles and wire ties and ballasted with rock dump. Toward the top of the bank stakes were driven into the ground through the brush to hold the wire fastenings. Where the shore protections met the full force of the current their channel ends were strengthened by a single row of piles wattled with poles. Behind the "mats," and at other suitable places, willows, cotton woods, and other water-loving trees were planted.

In the prosecution of the work thus outlined there were removed from the river 409 logs and snags and 1,013 overhanging trees. At Mound Bar there were removed 126 old piles and 805 cubic yards of gravel, and there were built 1,700 linear feet of dams and 400 square yards of bank protection mats. This work involved the driving of 1,037 piles, cutting and placing of 622 cords of brush, hauling and placing 592 cubic yards of rock ballast, placing 162 cubic yards of gravel ballast, and planting of 210 trees; 4,000 feet B. M. of lumber were used for braces and wails of dams, and 600 pounds of No. 6 annealed wire and 600 pounds of nails and spikes were used for fastenings. (A map of Mound Bar is attached.)

At Woolfolk, 9 miles below Columbus, the hull of the old steamer *W. D. Ellis* was sunk to form a jetty 135 feet long, preliminary to a future prosecution of the improvement of that part of the river.

At the close of the present fiscal year the improvement of Mound Bar stands well, and there is no danger of the boats getting aground there.

The general commerce of the Chattahoochee River warrants a good channel. The works for contraction of the stream and protection of the banks are from necessity built of perishable materials, and require repairs for their maintenance. Nearly all the old works now need extensive repairs and modifications. It is therefore recommended that a sufficient appropriation be made to repair the old works as well as to construct new ones.

Cost is estimated thus:

Removing annual accumulation of drift and snags	$5,000
Repairs of plant, including hull for snag boat *Chattahoochee*	12,000
Completion of improvement at Woolfolk Bar	7,000
Repairs to works of contraction in Hospital Reach, near Columbus, Ga	15,000
Repairs to works of contraction at Upatoie Creek	5,000
Repairs to works of contraction at Shell Creek	5,000
Excavation and control of water in channel at St. Francis Bend	30,000
Excavation of rocks at King Rock and Rock Island	21,000
Total	100,000

All of which can be profitably expended during the fiscal year ending June 30, 1895.

RECOMMENDATIONS AND ESTIMATES.

The hull of the stern-wheel snag boat *Chattahoochee* is worn out and is not worth further repairs. The maintenance of this snag boat in good condition is absolutely essential to the safe navigation of the river, for each freshet brings logs and snags into the channel, which must be removed for the safety of navigation. The cost of the practical rebuilding of the snag boat, required, is estimated at $10,000.

The maintenance of good navigation on the Chattahoochee River is of great importance to a large section of country extending from Columbus, Ga., to Apalachicola, Fla. The commerce is large and many steamboats are employed on the river. The spur dams built several years ago at the shoals immediately below Columbus, of comparatively light material on account of inadequate appropriations for more substantial works, are now in such bad condition, and have been so washed away, that boats reached Columbus with the greatest difficulty during the last low-water season. Unless a sufficiently large appropriation is made to renew these works, it is probable that boats will not be able to reach Columbus at all by another low-water season. If a sufficiently large appropriation be made to complete the projected improvements at the Mound, Woolfolk, Upatoie, and Shell Creek Bars, and at St. Francis Bend and Rock Island, it is probable that thereafter an annual appropriation of $10,000 will suffice for the annual snagging operations, and for the maintenance of the contraction and shore protection works.

An estimate of $100,000 as the amount that can be profitably expended in the fiscal year ending June 30, 1895, is therefore submitted.

Money statement.

July 1, 1892, balance unexpended	$1,47[illegible]
Amount appropriated by act approved July 13, 1892	20,[illegible]
	21,47[illegible]
July 30, 1893, amount expended during fiscal year	13,31[illegible]
July 1, 1893, balance unexpended	8,1[illegible]
July 1, 1893, outstanding liabilities	2,56[illegible]
July 1, 1893, balance available	5,58[illegible]
Amount that can be profitably expended in fiscal year ending June 30, 1895 Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	100,[illegible]

COMMERCIAL STATISTICS.

The following business, done by the steamboats named below, has been compiled from statements furnished by the agents of the Central Line, the People's Line, the Merchants and Planters Line, and the Columbus and Gulf Navigation Company, of Columbus, Ga.

The steamboats run from Columbus, Ga., to the junction of the Chattahoochee and Flint rivers; thence up the Flint River to Bainbridge, Ga.; then return to the junction, and run down the Apalachicola River to Apalachicola, Fla. On the return they go first to Bainbridge, then to Columbus. Stops are made at any intermediate landings where business is offered.

Stern-wheel steamboats.	Registered tonnage.	Draft of water.		Round trips between Columbus and Apalachicola via Bainbridge.	Passengers
		Light.	Loaded.		
		Inches.	*Feet.*		
Fannie Fearn	179.32	24	5	26	[illegible]
Queen City	150.03	22	5	33	[illegible]
Apalachee	161.90	28	5	21	[illegible]
Flint	135.51	18	5	3	
Pactolus	149.12	24	5	5	[illegible]
Naiad	173.77	18	4½	35	

Freight carried.

Articles.	Quantity.	Tons.	Articles.	Quantity.	Tons.
otton .... bales..	19,188	4,797	Miscellaneous freight..... .... packages..	218,880	7,206
otton seed......... sacks..	10,609	351	Bricks .... number..	452,000	904
rtilizers............. do...	35,320	3,532	Shingles............ do....	2,575,000	900
ides and skins.. bundles..	149	12	Rosin .... barrels..	11,000	2,500
ve stock........... head..	248	92	Spirits turpentine .. do....	4,650	1,000
umber......... feet, b. m..	190,086	317			
aves. .... pieces..	23,660	50			
ovisions...... packages..	171,631	17,163	Total...............	....	39,856
ain................ sacks..	17,028	942			

Estimated value of above freights is $1,615,494.54.

The rafting of hewed and sawed timber and logs is also carried on extensively, but available records of the business are kept.

PROVEMENT OF CHATTAHOOCHEE RIVER, GEORGIA AND ALABAMA, BETWEEN WEST POINT AND FRANKLIN.

PLAN OF IMPROVEMENT.

This section of 38 miles of the river consists of a series of pools arying in length from one-half to 5 or 6 miles, separated by rock shoals nd rapids, in some of which the fall is as great as 8 feet to the mile. the pools the width of the river is from 300 to 500 feet, with a chanel nowhere less than 4 feet deep. At the shoals the river is much ider, with numerous islands, and low-water depths in many places of ly a few inches. The bottom is generally of rock, and the banks are able. There are few, if any, sand or gravel bars and but few snags.

An examination and partial survey of the Chattahoochee River from ainesville, Ga., to Columbus, Ga., which includes the section between est Point and Franklin was made in 1879, under the direction of eut. Col. (then Maj.) W. R. King, whose report is printed on page 05 of the Report of the Chief of Engineers for 1880. This report ated that the improvement of the section of river from the West oint and Atlantic Railroad bridge, near Atlanta, to West Point, a stance of 108 miles, appeared entirely feasible at an estimated cost of 86,474, which includes the cost of eight locks.

The river and harbor act of September 19, 1890, provided for a preinary examination of the Chattahoochee River, Georgia and Alama, between West Point and Franklin. This examination was made November, 1890, by Assistant Engineer Thomas Robinson, and my port thereon is printed at page 1756 of the Report of the Chief of gineers for 1891. From the cursory examination made by passing wn the river in a skiff, at a stage above low water, Mr. Robinson ncluded that the section of river under consideration could be made vigable by the construction of one lock at Bentley Mill, and by rock cavation and training dams at the other shoals and rapids. For the asons stated in the report, Mr. Robinson and myself recommended at this section of river should be surveyed for the purpose of subtting plans and estimates for its improvement. The Chief of Engiers and the division engineer did not concur in this recommendation, d no survey was made.

The river and harbor act of July 13, 1892, contained this provision:

> nproving Chattahoochee River, Georgia and Alabama: Continuing improvement, nty-five thousand dollars, of which five thousand dollars are to be used on that tion of the river between West Point and Franklin.

After the passage of this appropriation it was learned that the Chattahoochee Navigation Company, which claims to have spent about $16,000 in improvement work on the river, had employed Mr. David C. Barrow, jr., civil engineer, to make a survey between West Point and Franklin in 1890. The Chattahoochee Navigation Company furnished this office with a copy of his report and maps.

On July 26, 1892, the following project of improvement for this section of river was submitted by me:

Project.—To remove the lesser rock shoals, sand and gravel bars by excavation and by works of contraction; to remove overhanging trees from the banks, and snags, logs, and other obstructions from the channel and to overcome the more serious obstructions by the construction of locks and dams to give a minimum depth of 3 feet at low water in the channel between West Point and Franklin, a distance of [illegible] miles.

I recommend further that a party be organized for working on the shoals between West Point and Bentley Mill, and continue working until the shoals are put in as good condition as practicable, or, until the funds are exhausted.

After the completion of the survey at Bentley Mill, and after experience has shown the average cost per cubic yard of the work on the shoals, I shall submit an estimate of the cost of completing the improvement.

These recommendations were approved by letter of August 5, 1892.

APPROPRIATIONS.

July 13, 1892 (allotment from appropriation for improving Chattahoochee River, Georgia and Alabama) .... $5,0[illegible]

WORK DONE DURING THE PAST FISCAL YEAR.

Assistant Engineer D. M. Andrews, who has had eight years' experience on similar work on the Coosa River, was placed in local charge of the work, and reports as follows:

The work of improving this section of the Chattahoochee River was commenced by the United States on August 15, 1892, at Flat Rock Shoals, about 1¼ miles above West Point, Ga., and has been confined entirely to these shoals during the past fiscal year.

The Flat Rock Shoals consist of a series of granite reefs or ledges, with deep water between, extending over about one-half mile of the river. A channel has been partly blasted through these reefs, and the stone thus obtained has been used in the construction of the necessary wing and training dams to concentrate the water in the channel, and reduce the slope. Work was suspended on November 16, 1892, on account of high water and cold weather, and was resumed again on June 3, 1893.

The improvement of this shoal being unfinished no map is submitted. A survey for a canal and lock at Bentley Mill was made August 15 to August 18, 1892, inclusive. The canal at this point had been partly excavated by the Chattahoochee Navigation Company, previous to the date of the survey.

The following is a statement of the cost of the improvement to July 1, 1893:

Flat Rock Shoals:	
Plant	$237.[illegible]
Labor	1,401.[illegible]
Engineering and superintendence	125.[illegible]
Subsistence	286.[illegible]
Miscellaneous (mileage, office expenses, etc.)	150.[illegible]
Material (dynamite, powder, etc.)	684.[illegible]
	2,895.[illegible]
Survey at Bentley Mill	121.[illegible]
Total	3,016.[illegible]

Rock excavation, 567 cubic yards.

Cost of rock excavation per cubic yard, $5.11, which includes the cost of depositing it in and building the training dams.

The smallness of the appropriation having prohibited the purchase of an adequate plant, the most primitive methods of hand labor have been employed. The funds available will probably complete the improvement of Flat Rock, Robert, and Haynes Shoals. This will carry the improvement to Potts and Ferrell Shoals, 6 or 7 miles above West Point, where 2 locks and dams will be required to make a practicable low-water navigation.

RECOMMENDATIONS AND ESTIMATES.

On April 22, 1893, the report of Assistant Engineer D. M. Andrews, on his survey for a lock at Bentley Mill, with estimate of cost thereof, together with an estimate of the cost of completing the improvement of the section of river between West Point and Franklin, was forwarded to the Chief of Engineers, through the Division Engineer of the Southwest Division.

As a result of the experience in carrying on the work on the river during the low-water season of 1892, and assuming the correctness of Mr. Barrow's levels, it was stated that at least six locks and dams will be required to secure a practicable and safe navigation of the river between West Point and Franklin. The locks will be required at the following localities, viz:

Jackson Shoals, having 7 feet fall in 0.75 miles.

Swanson, or Beasley Shoals, having 7 feet fall in 1.14 miles.

McGhee, or Buzzard Island Shoals, having 8½ feet fall in 1.36 miles.

Bentley Mill Dam, having 6 feet lift.

Hugnley, Ferrell, and Potts Shoals, having a combined fall of 16 feet in 2.14 miles, to be overcome by two locks.

The estimated cost of completing the improvement was stated to be $364,340.43.

Under date of May 3, 1893, I was informed by letter from the Office of the Chief of Engineers that—

> Your letter of the 22d ultimo, submitting estimate for improving Chattahoochee River between West Point and Franklin, has been received at this office with indorsement by the Division Engineer, of which the following is a copy:
>
> [First indorsement.]
>
> U. S. ENGINEER OFFICE,
> SOUTHWEST DIVISION,
> *New York, May 2, 1893.*
>
> Respecfully forwarded to the Chief of Engineers.
>
> In the report of the Chief of Engineers for 1880, p. 1708, Maj. King gives an estimate for improving the Chattahoochee River below West Point, to Columbus, by 48 locks in 34 miles.
>
> This project is for improving about 38 miles, above West Point, by 6 locks and dams, at an estimated cost of $364,000.
>
> I have previously reported that I did not think this part of the river worthy of improvement. With an appropriation of but $5,000 this project is not recommended for approval.
>
> The available funds should be used in giving such relief to navigation as can be rendered by removal of rocks, bars, and snags, where such work is necessary.
>
> C. B. COMSTOCK,
> *Colonel of Engineers, Bvt. Brig. Gen., U. S. A., Division Engineer.*
>
> The views and recommendations of the division engineer are approved.

In accordance with the above the balance of the appropriation of $5,000 will be expended during the season of 1893 in continuing rock excavation in the shoals above West Point. The balance available will probably complete the improvement of Flat Rock, Robert, and Haynes Shoals, which will carry the work to the foot of Potts Shoals, about 6 or 7 miles above West Point.

As before stated, a useful navigation can be secured through these shoals only by the construction of locks and dams. It is probable, therefore, that by the end of the present working season, the improvement will have been carried as far as can be usefully done under the approved method, and no estimate is submitted of the amount that can be profitably expended during the fiscal year ending June 30, 1895.

Money statement.

Amount appropriated by act approved July 13, 1892	$5,000.00
June 30, 1893, amount expended during fiscal year	2,759.61
July 1, 1893, balance unexpended	2,240.39
July 1, 1893, outstanding liabilities	256.89
July 1, 1893, balance available	1,983.50

COMMERCIAL STATISTICS.

The following information is furnished by Messrs. W. C. and L. Lanier, of the Chattahoochee Navigation Company:

Stern-wheel steamboats.	Registered tonnage.	Draft of water.		Round trips between West Point and Langdale	Passengers.
		Light.	Loaded.		
		Feet.	*Feet.*		
C. W. Jones	30	1	3	161	None.
Spray	80	1	3	143	None.

Freight carried.

Articles.	Quantity.	Tons.
Cotton ... bales	7,100	2,211
Cotton seed		70
Lumber ... feet	63,000	157
Provisions		12
Miscellaneous freight ... packages	1,600	184
Manufactured cotton goods ... do	10,800	2,160
Waste and bagging ... do	396	79
Total		4,873

Estimated value of above freights, $1,200,000.

While the return shows the operation or work of two boats, it was only of one, as the *C. W. Jones* was abandoned and machinery put on the *Spray* in January. * * * When opened up to Franklin, a distance of about 40 miles, we would expect an increase of freight and passenger business to keep actively employed on the river three or four boats of largely increased capacity. We are offered much more business, six months in the year, than we can do now, but we do not care to put on the river other boats until the work is complete for a farther distance. On the river near by is now being erected a half-million dollar cotton mill in addition to the one already erected. We will rely largely on the river cotton to run these mills.

P 5.

IMPROVEMENT OF LA GRANGE BAYOU AND HOLMES RIVER, FLORIDA.

PLAN OF IMPROVEMENT.

An examination of La Grange Bayou was ordered by the act of March 3, 1881. The report of the examination, by Capt. Damrell, with an estimate for deepening the channel by dredging, to admit the passage of vessels drawing 4½ feet at mean low water, at a cost of $19,994.30, was printed in the Report of the Chief of Engineers for 1882, p. 1318.

The act of August 2, 1882, provided for the expenditure on La Grange Bayou of $2,000 of the $20,000 appropriated for the improvement of the Choctawhatchee River.

The act of August 5, 1886, appropriated $2,000 for the improvement of La Grange Bayou, but as so small a sum could not be profitably expended, it was decided to hold it until a further appropriation was made.

The act of August 11, 1888, appropriated $3,000 *to complete* the improvement of La Grange Bayou, including Holmes River, as far as the town of Vernon.

In February, 1889, an examination of both La Grange Bayou and Holmes River was made. This examination showed that the improvement could not be *completed* with the amount available, and the Secretary of War therefore directed that no further expenditure should be made from the appropriations.

There is a balance still available from the appropriations of August 5, 1886, and August 11, 1888, of $4,839.20.

The act of September 19, 1890, made an appropriation for "improving La Grange Bayou, Florida, continuing improvement of Holmes River, $3,000."

Under this appropriation a project was approved for improving Holmes River by removing logs and snags from the channel and overhanging trees from the banks, between the mouth and the town of Vernon, Fla., an estimated distance of 28 miles.

APPROPRIATIONS.

June 15, 1844, for Choctawhatcheee and Holmes rivers	$10,000
August 2, 1882, allotted from appropriation for Choctawhatchee River	2,000
August 5, 1886	2,000
August 11, 1888, to complete the improvement of La Grange Bayou, including Holmes River, as far as the town of Vernon	3,000
September 19, 1890, improving La Grange Bayou, Fla.; continuing improvement of Holmes River	3,000

OPERATIONS TO JUNE 30, 1892.

The allotment of $2,000 under the act of August 2, 1882, was expended in the removal of snags and logs, and in dredging about 3,500 cubic yards of mud from the channel in La Grange Bayou; since then no work has been done at the bayou.

Under the act of September 19, 1890, $3,000 was expended in removing snags and logs from the channel and overhanging trees from the banks of the Holmes River, between its mouth and Vernon, Fla. For this purpose the snag boat belonging to the Choctawhatchee River was used. The work was completed in February, 1891.

RECOMMENDATIONS AND ESTIMATES.

There are no bars in the Holmes River, and it is probable that its navigation will not again be impeded by snags and overhanging trees for several years. There is but little commerce on it. It is therefore recommended that no further appropriations be made for its improvement until such time as the necessities of commerce may require it. Its improvement has no connection whatever with that of La Grange Bayou. Should it at any time be resumed, it can be best carried on in conjunction with the improvement of the Choctawhatchee River, of which it is an affluent.

Money statement.

July 1, 1892, balance unexpended	$4,839.20
July 1, 1893, balance unexpended	4,839.20

COMMERCIAL STATISTICS.

La Grange Bayou, Florida.—Assistant Engineer J. E. Turtle reports:

"The commerce consists mainly in carrying supplies for the small town of Freeport, Fla. There is also a small trade in lumber, shingles, etc., on this bayou.

"The business is carried on in such way that no reliable statistics of quantities are obtainable, but the value of the commodities transported is estimated roughly at $40,000 for the year."

Holmes River, Florida.—Assistant Engineer J. E. Turtle reports:

"The commerce of Holmes River is increasing in shipment out, of cotton, molasses, fowls, and honey, while the necessary supplies for the inhabitants are beginning to be taken by water from Pensacola. The business has been done in flat-boats and schooners, and it has been impossible to obtain reliable estimates of quantities. It is stated that a boat will be put on this stream during the fall of 1893, and I have confidence in its establishing a good trade.

"The value of the commerce for the fiscal year is roughly estimated at $12,000."

P 6.

IMPROVEMENT OF CHOCTAWHATCHEE RIVER, FLORIDA AND ALABAMA.

PLAN OF IMPROVEMENT.

The present plan of improvement was adopted in accordance with the recommendations contained in the reports of examinations and surveys of the river, printed in the Annual Reports of the Chief of Engineers for 1872, p. 588, and 1889, p. 1423.

The project provides for obtaining a low-water navigable channel from the mouth of the river to Newton, Ala., an estimated distance of 162 miles by the removal of logs and snags from the channel and overhanging trees from the banks, by excavating rock shoals, and by deepening sand bars by works of contraction and shore protection.

At Caryville, Fla., 100 miles above its mouth, the river is crossed by the Pensacola and Atlantic Railroad.

The country along the river below Caryville is sparsely settled, and the business consists almost exclusively in the cutting and rafting of lumber. This portion of the river is so little used for commercial purposes that no work has been done on it for several years past.

Geneva, Ala., 25 miles above Caryville, is a thriving town and is the trading and shipping point for a rich agricultural region surrounding t, which is rapidly increasing in population, and which is dependent upon the river for the transportation of its products and supplies. Nearly all the commere of the river is carried on between Geneva and Caryville, the nearest railroad point. During recent years the improvement has consequently been confined mainly to this section of the river. The channel has been pretty well cleared of the accumulation of snags and logs which formerly obstructed it, but low-water navigation is still impeded by several sand bars.

During the low-water season of 1892 the deepening of these bars by works of contraction and shore protection was begun, and it is proposed to continue this work as funds are available.

Between Geneva and Hollis Bridge, 30 miles above, the river is obstructed by snags and sunken logs, and occasionally by sand bars.

The obstructions have from time to time been partially cleared out between Geneva and Pate Landing, 25 miles above, and when freight is offered steamboats run to Pate Landing at favorable stages of water.

Between Hollis Bridge and Newton, 7 miles above, low-water navigation is prevented by a series of nine shoals, formed by strata of very compact blue clay. Since the completion of the Alabama Midland Railroad, from Montgomery, Ala., to Bainbridge, Ga., which passes through Newton, the urgent necessity for the improvement of this section of the river no longer exists.

It is doubtful if this section of the river would now be much used even if the projected improvements, which contemplated excavating channels through the shoals and confining the water thereto by training dams, were completed. From experience with similar work on other rivers it is also doubtful whether this method of improvement will provide for satisfactory navigation at low water, and it is probable that this can only be secured by a system of slack-water navigation by locks and dams, at a cost not warranted by any prospective benefit to be derived therefrom. Unless otherwise directed, it is therefore not proposed to do any work on the river above Pate Landing until the section between this point and Caryville has been put in good navigable condition for all stages of water.

After this is accomplished the annual cost of maintaining the snag boat for the removal of the logs and snags brought in by the winter freshets, and for keeping the contraction and shore protection works in repair, is estimated at $6,000.

APPROPRIATIONS.

March 3, 1833	$5,000	March 3, 1881	$10,000
June 15, 1844, for Choctawhatchee and Holmes rivers	10,000	August 2, 1882	18,000
		July 5, 1884	15,000
		August 5, 1886	15,000
June 25, 1874	5,000	August 11, 1888	10,000
March 3, 1875	5,000	September 19, 1890	12,500
August 4, 1876	5,000	July 13, 1892	12,500
March 3, 1879	5,000		
June 14, 1880	7,000	Total (since 1874)	120,000

OPERATIONS TO JUNE 30, 1892.

Operations were confined almost exclusively to the removal of the great accumulation of logs and snags from the channel and overhanging trees from the banks, and to providing and maintaining the necessary plant for this work.

The section of the river between its mouth and Caryville having been sufficiently improved to accommodate the small commerce thereon, the work during recent years has been mainly carried on between Caryville and Geneva, but some work has also been done between Geneva and Pate Landing.

The improvement accomplished, although incomplete, has resulted in great benefit to navigation. Steamboats now run at all stages of water between Geneva and Caryville, but at low water full loads can not be carried, and they are much delayed by sand bars, which can be readily deepened if sufficiently large appropriations are made for the work.

WORK DONE DURING PAST FISCAL YEAR.

Assistant Engineer J. E. Turtle, who has been in local charge of the work, reports:

As soon as the stage of water admitted, at the beginning of the season of 1892, the snag boat *Choctawhatchee* was started out to remove the most troublesome ot the snags which had been brought into the channel by the previous high water, and after accomplishing this to begin contraction work at Buzzard Bar. The snagging trip was completed on July 15, 1892, and the improvement at Buzzard Bar was commenced.

During October, 1891, surveys of Buzzard Bar, Gumfield and Busby shoals had been made, and plans of improvement determined upon.

The plans for improvements provided for transverse and longitudinal dams built of piles, poles, brush, and stone, but later experience suggested that the stone could be generally omitted. The type of these dams is shown on sheet No. 1 (B).

Buzzard Bar.—The upstream dam, "A," is composed of parallel rows of piles, with the space between filled with brush, which for convenience was tied into bundles and weighted with stones sufficient to hold it in place. The remaining dams, which are transverse, consist of one row of piles driven about 6 feet apart in the row, and then wattled with as heavy poles as could be readily bent, as shown on sheet above-mentioned. These wattling poles were firmly rammed to the bottom, the butt of the second pole being placed to catch on to the pile lapped by the small end of the first in order to avoid openings between the poles. After the first of these wattled dams was completed a head of water quite noticeable had been created, and scour under the poles was feared; to avoid this, bundles of brush were forced to the bottom on the upsteam side, where they were held in place by the force of the current passing between the poles, and by the projecting ends of the poles. Four of these transverse dams were built at Buzzard Bar, aggregating 644 feet in length.

Gumfield Shoals.—The Type of transverse dams at Gumfield Shoals (sheet No. 2) is similar to those at Buzzard Bar, except that instead of stone to hold the brush in place in the upstream dam, strong poles were spiked to diagonally opposite piles, the brush being first somewhat compressed. Two of these transverse dams were built, aggregating 380 feet in length.

Busby Shoals.—The contraction work at this shoal (sheet No. 3) consists of a transverse dam 168 feet in length; and, connecting with this, a longitudinal dam 462 feet in length, the same type being used.

The bars on this river are due to local causes, mainly to excessive widths, and are generally composed of sand not very compact. The commerce of the river demands a low-water depth of about 3 feet, or an increase over the original depth of 14 inches, and the contractions were made with a view to accomplish this and no more, and obtain it, if possible, by the current force of stages some few feet above low water, and to leave the current force of low water too feeble to produce scour. The object in view was to prevent the lowering of the low-water level of the pools, and consequent decrease of depth on the next shoals above. A height of dam of 20 inches above low water seemed to meet the requirements.

A comparison of the cross sections on the maps herewith submitted indicates that the desired result is being accomplished.

An examination of these dams made during the latter part of June showed that they have not been injured by the high water of 1892–'93, and that a bar has formed immediately below and behind all the dams, which will be exposed during the low water of the coming season.

When the soundings for comparison were taken, on the 24th and 25th of June the water was 2 feet above low water, and from the softness of the sand I should say that some few inches more of depth will be secured before the water will have fallen to low water.

Experience has shown that these types of dam have answered the purpose and are quickly and cheaply built, and they will be used for contraction works on the remaining shoals.

The dams at the above shoals were completed on November 4, and on the 5th the water being low, snagging operations were again resumed, and the river thoroug-

Sheet No. 1

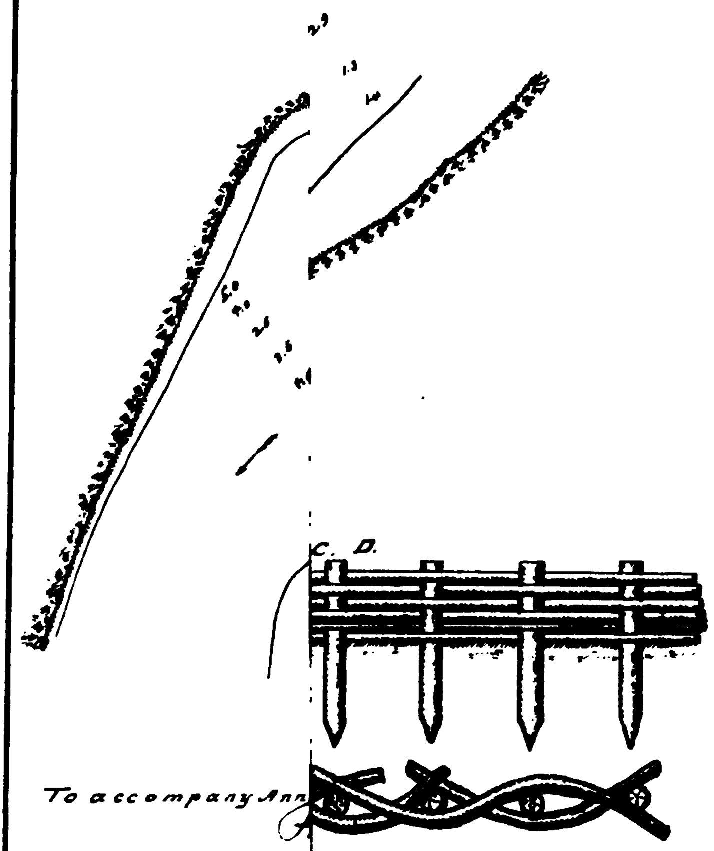
ROVEMENT

f

LS

Surveye

Asst. E



To accompany Ann

Photo-Lith by A. HOEN & CO., Balto., Md

Eng 93

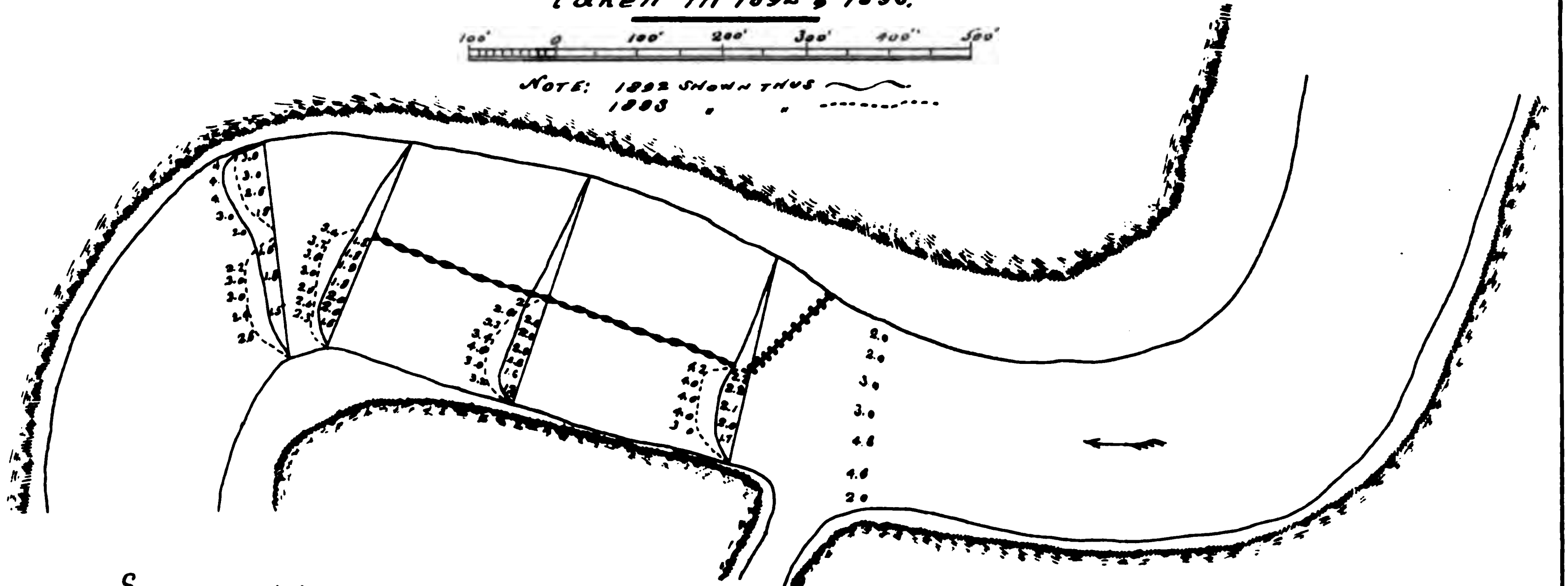
SHEET No. 3

CHOCTAWHATCHEE RIVER IMPROVEMENT

Comparison of Cross-sections of

BUSBY SHOALS

taken in 1892 & 1893.



Surveyed and drawn
by
Asst. Engineer. J. E. Turtle.

To accompany Annual Report for 1893.
Philip M. Price.
Captain of Engineers.

worked over from Geneva to Caryville. This work was completed on December 21, when property was stored and placed in charge of a watchman.

In December, 1892, one quarter boat 62 by 12 feet, and one pile-driver barge, 56 by 16 feet, were purchased at Freeport, Fla. On January 24 the snag boat was sent from Caryville for these, returning with them on February 2. During the months of February and March the snag boat, quarter boat, and pile-driving barge were each painted two coats of paint, and the machinery was thoroughly overhauled; the hoisting engine, which had been housed at Fort McRee since the suspension of work on the groins, was shipped to Caryville and placed upon the pile-driving barge. All painting and repairs were completed on March 18, and all the plant placed in charge of the master of the boat as watchman.

On June 26, 1893, the water having fallen to a working stage, work was again resumed. The snag boat started out to remove such obstructions as had been washed into the channel by the high water of 1892-'93, and a party began driving piles at the cut-off to prevent injurious caving of the bank at that point. The cut-off is three miles above Caryville. It is proposed to put both parties on contraction work so soon as the dangerous snags are removed.

The working season of 1892 was most unfavorable for operations, at first owing to prolonged high water and later to malarial sickness among the crew. Owing to high water, the piles in Dam A, Buzzard Bar, had to be all redriven, many of them three times, while during September it was impossible to keep a full crew, owing to sickness.

Work performed was as follows:

Snags removed from the channel		993
Overhanging trees removed from the banks		231
Stumps removed level with bank		25
Piles driven		552
Stone placed on dams	cubic yards	10
ogs on bank cut up		25
ength of dams completed	feet	1,654
ost per running foot of dam		$1.46
ost of channel work		$1,649.75

The work accomplished during the year has enabled the boats on this river to run y day and night with the water at low water, and this, too, with large loads of reight—a condition never before known. A recent examination of the river also hows that the work of maintenance has been greatly reduced and that more atention can be now given to contraction work and to bank protection.

At the suspension of operations for the season of 1894 the snag boat should be ocked and about $1,500 expended in repairs.

RECOMMENDATIONS AND ESTIMATES.

With liberal appropriations for a few years the section of river beween Caryville and Pate Landing, upon which the neighboring ountry is dependent for transportation facilities, can be placed in ood navigable condition at all stages of water, and thereafter the ost of maintenance will not exceed $6,000 per year.

Considerations of economy as well as the commercial importance of e river make it desirable that the projected improvements should be mpleted as soon as practicable.

Money statement.

ly 1, 1892, balance unexpended	$5,321.72
nount appropriated by act approved July 13, 1892	12,500.00
	17,821.72
ne 30, 1893, amount expended during fiscal year	7,582.66
ly 1, 1893, balance unexpended	10,239.06
ly 1, 1893, outstanding liabilities	573.75
ly 1, 1893, balance available	9,665.31
mount that can be profitably expended in fiscal year ending June 30, 1895	30,000.00
bmitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

COMMERCIAL STATISTICS.

Captains J. D. Jenkins and A. F. Tatom, of Geneva, Ala., report the followi commercial statistics for the year ending June 30, 1893:

Stern-wheel steamboat.	Registered tonnage.	Draft of water.		Round trips between Geneva and Caryville.	Passeng
		Light.	Loaded.		
		Inches.	*Inches.*		
Joe Davis	91.06	14	32	228	[illegible]
Mary Alice	39.37	14	32	109	[illegible]

Freight carried.

Articles.	Quantity.	Ton
Cotton ... bales	8,991	[illegible]
Cotton seed ... sacks	25	[illegible]
Fertilizers ... do	28,462	[illegible]
Provisions ... packages	25,429	[illegible]
Grain ... sacks	36,912	[illegible]
Turpentine ... barrels	800	[illegible]
Miscellaneous freight	....	[illegible]
Hides	....	[illegible]
Total weight		[illegible]

Estimated value of above in round numbers ... [illegible]
Estimated value of lumber trade on river ... [illegible]

P 7.

IMPROVEMENT OF HARBOR AT PENSACOLA, FLA.

PLAN OF IMPROVEMENT.

The present plan of improvement was adopted in accordance with the recommendations contained in the report of the Board of Engineers fo fortifications and for river and harbor improvements, dated Februar 12, 1881, and printed in the Annual Report of the Chief of Engineer for 1881, p. 1177.

The project provided for dredging a channel 300 feet wide and 24 fe deep at mean low water across the inner bar, for the temporary reli of navigation, and for protecting the shore line near Fort McRee fro further abrasion by the construction of jetties and works of shore pro tection, with the view to preventing further injurious changes in t tidal currents, and also of retaining the position for defensive purpose

At that time the least mean low-water depth on the inner bar wa 19½ feet. Between 1881 and 1886 the inner-bar channel was dredg at various times, and in the latter year it was reported that a chann 120 feet wide and 24 feet deep had been obtained.

The further injurious abrasion of the shore line near Fort McRee wa stopped by the construction of two groins of stone and concrete nea at right angles to the shore line. The groins were completed in Apr 1890.

In the spring of 1890 another survey of the entrance to the harb was made, which showed that the channel across the inner bar h shoaled since 1886 from the reported depth of 24 feet to a least dep of 19.6 feet. On January 17, 1891, the report of this survey was referred to a Board of Engineers appointed to assemble at Pensacola, Fla., to consider and report upon improvements of the harbor. The report of this Board is dated July 16, 1891, and is printed in the Annual Report of the Chief of Engineers for 1891, p. 1723.

The plan of improvement recommended by the Board, with the reasons therefor, is sufficiently indicated in the following extracts from their report:

6. *Character of bar and changes.*—The depth of water on the outer bar since the time of authentic surveys has remained constant at about 22 feet. Previous to the dredging done in accordance with the project of 1881 there was a depth of 19.5 feet across the inner bar. This was increased in 1886 to 24 feet, with a width of 120 feet. The growth of the middle ground has caused shoaling to take place in that channel until there remains at present a low-water depth of 19.6 feet, which is practically that which existed prior to improvement. The depth of water on the three principal shoals has not changed.

7. *Commerce.*—The commerce of Pensacola for the calendar year 1890 amounted to about $5,000,000, the principal exports consisting of cotton, naval stores, timber, and lumber, and the imports of fruit and fertilizers.

Over 300,000,000 feet of timber and lumber were shipped during the year.

Pensacola's foreign sailing tonnage exceeds that of all the other Gulf ports combined, including New Orleans.

Col. W. D. Chipley, vice-president of the Pennsacola and Atlantic Railway Company, in reports appended hereto, states that a movement is now fairly started through which Pensacola will export, in addition to the cotton, naval stores, and timber mentioned, coal and iron from the mines of Alabama, railroad, bridge, car, house, and ship building material, etc. He further states that Pensacola is beginning to send cotton goods, machinery, and Western produce of every kind to the Americas south of us, which shipments, he adds, will be largely increased under the policy of reciprocity.

After the deepening of the inner bar in 1881-'86 the commerce of the port was largely augmented and the class of vessels entering the harbor much improved. Shoaling has since taken place, and during the past year vessels have been detained after loading from one to five weeks before being able to go to sea. A number of vessels went aground on the inner bar, while a large number were obliged to put to sea with incomplete cargoes. Owing to the increased commerce of the port, the necessity for deep water is greater than before the first improvement was made. It is estimated that a reduction of from 8 to 20 per cent in freight rates would follow an increase of the navigable depth to 26 feet.

It will be seen that Pensacola has better natural conditions for deep water than any other Gulf port. Existing railroads are extending their lines, and new roads, projected or in process of construction, will afford ample facilities for communication with the interior. The importance of Pensacola from a military and naval standpoint has long since been recognized, and considerations of defense, as well as those governed by commercial necessities, demand the improvement of the entrance to its harbor.

8. *Plan of improvement.*—The method of obtaining deep water across the bar at the entrance to Pensacola Harbor by dredging was tried between 1881 and 1886, there having been obtained in the latter year a channel 120 feet in width and 24 feet in depth.

Although only five years have elapsed since then, the growth of the Middle Ground and Caucus shoals has been so rapid that the depth of water in the bar channel has already been reduced to that prevailing prior to the original improvement.

To obtain over the inner and outer bars, by dredging, a channel 24 feet deep and 300 feet wide will cost, in round numbers, $190,000, and will require an annual expenditure of $30,000 thereafter for its maintenance.

A more permanent channel would doubtless be one in the direction of the ebb flow across the outer end of Caucus Shoal, but to obtain this by dredging would cost, in round numbers, $357,000, and its self-maintenance without jetties to insure tidal scour and to protect the channel from the inflow of sand is doubtful.

There remains, then, the method of improvement by jetties, aided, if necessary, by dredging.

The further eastward advance of Caucus Shoal and southward advance of the Middle Ground Shoal should be arrested, and the ebb and flood flow should be united and trained across the bar in a favorable direction.

The location of the western jetty is fixed by the shore line, the present channel, and the direction of tidal flow across the bar. It now becomes necessary to so locate the eastern jetty as not only to arrest the westward travel of sand along the beach of Santa Rosa Island, but to obtain in the jetty channel the greatest tidal scour practicable without injury to the jetties themselves or to the present favorable tidal status of the bay.

9. *Description of jetties and order of construction.*—It is proposed to build the shore arm of the western jetty up to high water; from the shoulder point 5,000 feet from the shore end of the jetty the crest should be brought up to the mean height of the beginning of ebb outflow; for the next 4,300 feet the crest should be brought up to mean low water, from which point it will sink to the foundation course.

The shore arm of the eastern jetty should be built up to high water; the crest of the jetty will then sink within a distance of 1,200 feet to the level of the foundation course.

It is proposed to construct the jetties with a foundation course of brush mattresses 100 feet in width, and a superstructure of rubble stone capped with concrete.

The estimated cost of the improvement, which, in round numbers, is $1,830,000, supposes that money is regularly and adequately supplied. Without this the cost of the work will be largely increased and its success rendered doubtful.

Under date of August 3, 1891, the report of the board was referred to the Division Engineer, Southwest Division, for remark. His indorsement was as follows:

Respectfully returned to the Chief of Engineers.

The estimated cost of obtaining 24 feet of water by dredging is $190,000, and its annual maintenance is estimated at $30,000.

The estimated cost of the proposed low jetties is $1,800,000, while the final cost will probably be considerably greater. At 3 per cent the annual interest on $1,800,000 would be $54,900, much exceeding the estimated cost of maintenance of a dredged channel.

In view of these figures, and of the success thus far obtained in the maintenance of the Sandy Hook Channel, I think that the improvement should be continued by dredging, until it is found that $50,000 a year will not maintain a channel after it is once completed.

On November 12, 1891, the board submitted a supplementary report, in which it is stated:

Inasmuch as the plan of improvement recommended by the board contemplates an expenditure of $1,830,000, the annual interest on which at 3 per cent ($54,900) exceeds the estimated annual cost of maintenance of the dredged channel, the board desires to set forth more fully the reasons which compelled the rejection of the plan of improvement by dredging alone, and the substitution of the plan of improvement by jetties.

That a dredged channel across the inner and outer bars at Pensacola will not be self-maintaining has been demonstrated by experience. So few surveys of the bar have, however, been made that it is not possible to determine the rate at which the shoaling has taken place, and, therefore, for the purposes of estimating the cost of maintaining a dredged channel the rate of shoaling as shown by a comparison of the surveys of 1886 and 1890 was assumed. It is probable, however, that the volume of sand moving in the ship channel during that period was many times that determined by the method outlined. On the South Atlantic Coast, at Cumberland Sound, where the bar is composed of material somewhat similar to that at Pensacola, storms of a few days' duration have caused a shoaling of 3 feet and more in the ship channel, while at other times storms of equally short duration have produced as great a scour. It is possible that as great and sudden changes have taken place at Pensacola.

On ocean bars composed of coarse sand or gravel, dredging alone has, in some instances, proven successful, but on the bar at Pensacola, composed of very fine sand, easily placed and held in suspension, no such satisfactory results can be expected. An unjettied channel is, moreover, liable to be blockaded in a few days, or perhaps in a few hours by a heavy storm, while rough weather might prevent dredges from affording relief. If the port of Pensacola is to offer adequate facilities to its shipping, it is imperative that the depth of water on the bar shall not be liable to sudden fluctuations, and the great advantages which would accrue to the shipping by having a permanent and straight channel of probably a greater depth than 24 feet instead of the present crooked channel, with a probable depth during a considerable part of the year of much less than 24 feet, make it necessary that the plan of improvement by jetties should be adopted and the board can not, therefore, recommend a plan of improvement which has already proved a failure, which can, at best, give only temporary relief, and which may permit the blockade of the harbor during the busiest season of the year, and thus greatly and unnecessarily retard the development of the port and seriously injure its commerce.

A careful examination of the inner bar, made in November, 1892, showed that there had been not only a slight decrease in the least mean low water depth, viz, from 19.6 feet to 19.2 feet, but that there had also been a continued growth of the Middle Ground to the southward, and a consequent narrowing of the channel. In 1881 the distance between the 18-foot curves on the Middle Ground and Caucus Shoal, *i. e.*, the width of the 18-foot channel across the inner bar was 2,740 feet. In November, 1892, this distance had been reduced to 840 feet, and the 18-foot curve on the Middle Ground had moved 1,440 feet to the south. In 1887 the least depth on the inner bar on the range of the two beacon lights was about 22 feet. In November, 1892, the least depth on that range was 17.7 feet, and the best channel across the inner bar, with a least depth of 19.2 feet, was between the first and third ranges south of the beacon range, *i. e.*, between 75 and 225 feet south of the lighted channel. These facts appear to indicate that the 24-foot channel (of which the north edge is on the beacon range), now being dredged across the inner bar under the appropriation of July 13, 1892, will soon be filled up again by the continued growth of the Middle Ground, to the south.

APPROPRIATIONS.

June 18, 1878	$20,000	August 5, 1886	$20,000
March 3, 1879	10,000	August 11, 1888	35,000
June 14, 1880	40,000	September 19, 1890	25,000
March 3, 1881	20,000	July 13, 1892	75,000
August 2, 1882	50,000		
July 5, 1884	55,000	Total	350,000

OPERATIONS TO JUNE 30, 1892.

Work has been carried on, when funds have been available, since 1879. In 1879–'80 the wrecks obstructing the channel were removed. In April, 1890, two stone and concrete groins, for preventing further abrasion of the shore line at Fort McRee, were completed, and have so far accomplished the purpose for which they were built. Dredging was done at various times between 1881 and 1886, at which time a channel 120 feet wide and 24 feet deep across the inner bar was reported. In June, 1891, the suction dredge *Bayley*, belonging to the Mississippi River Jetty Company was hired for a short time to remove certain lumps which had appeared in the channel across the inner bar, and were causing serious delays in the departure of loaded vessel.

WORK DONE DURING THE PAST FISCAL YEAR.

Assistant Engineer J. E. Turtle, who has been in local charge of the work since 1887, reports as follows:

Work done during the fiscal year ending June 30, 1893, consisted chiefly in the care of property, and a few necessary surveys. The contract for dredging with R. Moore, of Mobile, Ala., required work to begin on January 1, 1893, but on account of the loss of his dredge while in transit, this time was extended to May 11. Owing to several delays it was not until May 24 that the trial of this new dredge was made, and even then the dredge was incomplete in many respects. The trial proved, however, that this dredge, built chiefly for this work, was thoroughly capable, and that good results could be looked for. After this trial the dredge went to Pensacola to complete necessary parts, and did not report again for duty until June 7. It was not even then well prepared to carry on the work, and about a week has since been consumed in building quarters, etc. The dredge is now practically completed and works day and night. The dredge is supplied with three suction pumps, of 10 inches diameter, and performs the work in a very satisfactory manner. Her capacity per minute, as stated below, for the actual time of pumping was 3.37 cubic yards.

The dredging is confined to the inner bar, and between the 24-foot curves. The north side of the channel corresponds with the McRee beacon range, or with the center of the channel previously dredged. The width of the channel as now marked out is 225 feet, while the length of the cut is 1,400 feet. How much wider the channel can be made with the funds available, depends upon the amount of material lost in the overflow; this amount is unusually large owing to the construction of the vats.

The weather, thus far, has been favorable for the prosecution of the work, and from the present indications it is thought that this contract will be completed not later than September 15.

Work performed: Number of cubic yards of material dredged, 27,852.37.

Details of dredging: Actual time of pumping, 94 hours 48 minutes; rate per minute in cubic yards, 3.37; time lost in turning and dumping, 43 hours 3 minutes; time lost for other causes, 206 hours 1 minute.

Much of the time reported as lost by other causes was consumed in actually completing the dredge after work had commenced.

For night work the area to be dredged is outlined with suitable lights, and the experience obtained thus far indicates that work at night can be carried on as well as during the day.

No actual survey for comparison has been made since this dredging was begun, the amount of work accomplished being considered too small for this purpose. But from the reports of the pilots the results are very satisfactory. In order that the earliest relief could be derived from the work the dredging has been carried on, as far as was practicable, in a narrow channel.

The menace to the channel over the Inner Bar continues to be the advance of the Middle Ground to the south. When the present plan of improvement was adopted in 1881, the distance between the 18-foot curve of Caucus Shoal on the harbor side and the 18-foot curve of the Middle Ground on the seaward side was 2,740 feet. The distance between these curves in November, 1892, was 840 feet. The advance of the Middle Ground since 1856 has been 3,385 feet. This advance and shoaling is nearly at right angles to the direction of the channel, the shoaling, of course, corresponding to the direction of the current; therefore this growth of the Middle Ground does not cause any corresponding contraction in the harbor entrance, and consequently there is no lowering of the crest of Caucus Shoals, or shifting of the channel to the south, due to this. This shoaling is represented on the tracing submitted herewith.

The deep water originally over the Inner Bar was, without doubt, a remnant of the deep water existing immediately in front of the harbor entrance before the origin of the Middle Ground.

The area of the cross-section between the 18-foot curves above mentioned and a line corresponding with the direction of the shoaling was, in 1856, 20,395 square feet. The tendency is evidently for the 18-foot curves to unite, and were they allowed to, it is extremely doubtful that there would be any increase of depth on the Caucus Shoals, due to it. The present area of the channel cross-section between and below the 18-foot curves on the same line as above is 415 square feet. As the Caucus Shoals have not been lowered by the growth of the Middle Ground filling on the line of its growth an area of 19,980 square feet, it can not be hoped that a filling of 415 square feet additional on the same line will bring about any result toward deepening the Caucus Shoals.

From the tracing it will be seen that the dredging is now being done directly across the Middle Ground, the north side of the channel cutting its 18-foot curve. When the present project was adopted it can be seen from the line marked 1881 that considerable relief was to be expected from dredging; but a comparison of the curves of 1881 and 1892 indicates that the shoaling of the dredged channel is likely to begin at once and be very rapid.

There is a demand here for ships drawing 24 feet. Many of this draft refuse come, owing to insufficient water. Many of this draft enter, but clear with part loads. This condition of things is undoubtedly an injury to the port, and the plan of improvement, whatever lines it be conducted upon, should contemplate a depth of not less than 25 feet. A vessel can not carry all the water there is in a channel, and this, too, in an exposed locality. Since the condition of the entrance changed so materially it is extremely doubtful if the requirements of this harbor can be profitably attained under the present approved plan, which was recommended by the Board of Engineers in 1881 for the *expressed* purpose of affording *temporary* relief only.

RECOMMENDATIONS AND ESTIMATES.

For the reasons given above the estimate of $500,000 for beginning the permanent improvement of the harbor by dredging a straight cha

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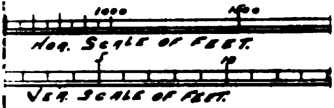

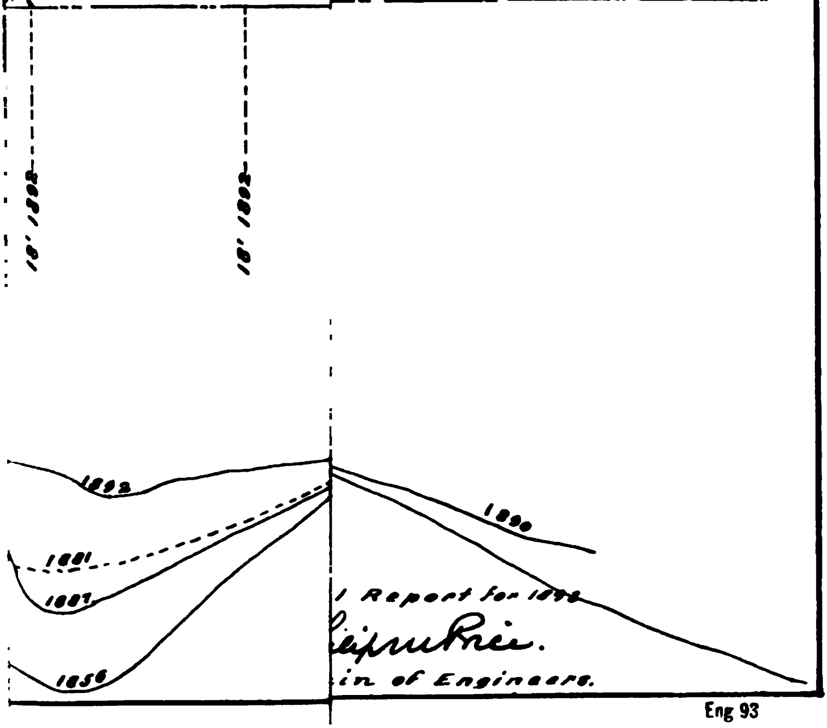

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nel across Caucus Shoal and preserving the same by jetties, which was submitted in the Annual Report of the Chief of Engineers for 1891, is renewed.

Money statement.

July 1, 1892, balance unexpended		$14,189.44
Amount appropriated by act approved July 13, 1892		75,000.00
		89,189.44
June 30, 1893, amount expended during fiscal year		5,895.59
July 1, 1893, balance unexpended		83,293.85
July 1, 1893, outstanding liabilities	$515.54	
July 1, 1893, amount covered by uncompleted contracts	74,811.81	
		75,327.35
July 1, 1893, balance available		7,966.50
Amount that can be profitably expended in fiscal year ending June 30, 1895 Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.		500,000.00

Abstract of bids received and opened on September 20, 1892, by Capt. Philip M. Price, Corps of Engineers, for dredging in harbor at Pensacola, Fla.

No.	Name and address of bidder.	Time of commencement.	Time of completion.	Price per cubic yard.
1	Rittenhouse Moore, Mobile, Ala	Jan. 1, 1893	Jan. 1, 1894	$0.63

COMMERCIAL STATISTICS.

The following statement of the business of the port of Pensacola, for the fiscal year ending June 30, 1893, has been furnished by the collector of customs:

Lumber exported ..... feet b. m.	336,995,000
Value of exports to foreign ports	$3,805,967
Value of exports to coastwise ports	468,705
Total exports	4,274,672
Value of imports from foreign ports	6,517,581
Total exports and imports	10,792,253
Duties on imports and miscellaneous collections	27,938

Vessels entering and clearing.

Vessels entering from foreign ports	460
Vessels entering from coastwise ports	89
Total entering	549
Vessels clearing for foreign ports	479
Vessels clearing for coastwise ports	86
Total clearing	565
Vessels employed in traffic of port	168

P 8.

IMPROVEMENT OF ESCAMBIA AND CONECUH RIVERS, FLORIDA AND ALABAMA.

PLAN OF IMPROVEMENT.

The Escambia and Conecuh rivers are actually one river, that portion of the river from its headwaters in southeastern Alabama to the Florida and Alabama State line being called the Conecuh River and the portion in Florida, 61 miles long, being called the Escambia River. It empties into Escambia Bay, an indentation from Pensacola Bay. Fully 60 per cent of the immense quantity of timber shipped from Pensacola Harbor is cut on lands tributary to the Escambia River, and is floated down in rafts to Pensacola Harbor.

The present plan of improvement was adopted in accordance with the recommendations contained in the reports of the examinations and surveys of the rivers, printed in the Annual Report of the Chief of Engineers for 1879, pp. 843, 852.

The project provides for the improvement of the river from its mouth to Indian Creek, in Alabama, an estimated distance of 293 miles, by the removal of logs and snags from the channel and overhanging trees from the banks, by excavating rock shoals, by deepening sand bars by works of contraction and shore protection, and by dredging a channel through the bar at the mouth of the river.

The object of the improvement is to facilitate the movement of saw logs and timber rafts down the river, and to afford at the same time a suitable channel for steamboat navigation. The value of the lumber annually transported on the river is estimated at over $1,800,000.

In order that the rafting business may be carried on safely and profitably, it is necessary that the river should be kept fairly free from logs and snags. This requires the maintenance of an efficient snag boat, at an estimated cost of $6,000 per annum.

In the fall of 1889 a channel 60 feet wide and 6 feet deep was dredged through the bar at the mouth of the river by means of a centrifugal sand pump mounted on the snag boat. This channel has since shoaled to 4 feet, and it is very desirable that a sufficient amount should be appropriated to enable a cut 100 feet wide and 8½ feet deep to be made.

The harbor tugs can not now cross the bar and enter the river to reach the rafts and tow them to Pensacola. The rafts are floated down over the bar and fastened to timber stands in the bay, where they are exposed to sudden storms. A large annual loss of lumber and money is thus occasioned.

APPROPRIATIONS.

For Escambia River:		For Escambia and Conecuh rivers:	
March 2, 1833	$5,000	July 5, 1884	$12,000
July 2, 1836	5,500	August 5, 1886	12,000
June 14, 1880	8,000	August 11, 1888	10,000
March 3, 1881	5,000	September 19, 1890	7,500
July 5, 1884	3,000	July 13, 1892	8,000
August 2, 1882	12,000		
		Total	88,000

OPERATIONS TO JUNE 30, 1892.

The appropriations had been expended in providing, maintaining, and renewing the necessary working plant, and in removing the obtance of 105 miles. Below Rome the Coosa is navigable during the entire year a distance of 188 miles, to Lock No. 4, 3 miles above the Georgia Pacific Railroad Bridge. Between Lock No. 4 and Wetumpka, a distance of 116 miles, the navigation of the Coosa is obstructed by a series of rocky reefs and shoals, separated by stretches of good navigable water, varying in length from one-half to 8 miles. The total fall in the low-water surface of this section of the river is 323 feet. The low-water discharge at Wetumpka is 5,800 cubic feet, the same as that reported for the Mississippi River at St. Paul. Below Wetumpka the Coosa, Alabama, and Mobile rivers afford good navigation during the entire year to tidewater at Mobile Bay.

The present plan of improvement was adopted in accordance with the recommendations contained in the reports of the various examinations and surveys, which are printed in the annual reports of the Chief of Engineers for 1871, 1872, 1875, 1878, 1881, and 1890.

The project provides for the removal of the lesser rock shoals and sand and gravel bars by excavation and by works of contraction, and for the construction of locks and dams to overcome the more serious obstructions.

By the various acts making appropriations the river has been divided into two sections, and separate appropriations have been made for each section.

In the upper section, between Rome and the East Tennessee, Virginia and Georgia Railroad Bridge, a distance of 236 miles, eight locks, with their accessory dams, will be required. Of these, three have been completed, and the fourth is now under construction. The work is carried on downstream in order that the completion of each lock and dam may immediately open an additional section of the river to the steamboats now running on the upper river.

In the lower section, between Wetumpka and the East Tennessee, Virginia and Georgia Railroad Bridge, a distance of 68 miles, twenty-three locks, with their accessory dams, will be required. The first appropriation for this section of the river was made by the act of September 19, 1890, which required that the work should be commenced at Wetumpka.

I. BETWEEN ROME, GA., AND THE EAST TENNESSEE, VIRGINIA AND GEORGIA RAILROAD BRIDGE.

APPROPRIATIONS.

August 14, 1876	$30,000	August 5, 1886	$45,000
June 18, 1878	75,000	August 11, 1888	60,000
March 3, 1879	45,000	September 19, 1890	150,000
June 14, 1880	75,000	July 13, 1892	130,000
March 3, 1881	60,000		
August 2, 1882	83,700	Total	803,700
July 5, 1884	50,000		

OPERATIONS TO JUNE 30, 1893.

Between 1876 and 1881 the principal obstructions in the channel between Rome, Ga., and Greensport, Ala., had been removed and a number of bars and rocky reefs improved by regulation works and excavation in the rock. Steamboats then made regular trips between Rome and Gadsden, and occasional trips to Greensport, Ala.

Below Greensport, at distances, respectively, of 0.68, 3.86, and 5.24 miles, three masonry locks, each 40 feet wide by 210 feet between miter sills, with their accessory dams, had been completed and opened to tugs which tow the rafts, to pass up to Ferry Pass, 1 mile above the mouth. The rafts are now dropped out of the river into the bay; this is frequently dangerous, and much loss is occasioned by it. The bar was dredged several years ago, with a very limited amount of funds, and a narrow channel having a depth of 6 feet was secured. This channel has now shoaled to 4 feet. If the operations on this stream are to be carried on in the interests of the lumber export trade of Pensacola, the deepening of the bar at the mouth is important, and will be of great benefit to the commercial interests of the port.

Experience has shown that the material composing the bar is readily removed with a sand pump. The channel across the bar should be dredged to a depth of 8½ feet, at low water, and 100 feet in width. This channel should be then marked with piles driven firmly 10 feet apart, to keep the tugs and rafts in it, and thereby greatly add to the permanency of the work.

I would respectfully recommend that an appropriation of $12,000 be made for the purpose of dredging the bar; and that $12,000 be appropriated for continuing and preserving the improvement of the river.

Money statement.

July 1, 1892, balance unexpended	$2,671.08
Amount appropriated by act approved July 13, 1892	8,000.00
	10,671.08
June 30, 1893, amount expended during fiscal year	7,982.17
July 1, 1893, balance unexpended	2,688.91
July 1, 1893, outstanding liabilities	568.30
July 1, 1893, balance available	2,120.61
Amount that can be profitably expended in fiscal year ending June 30, 1895 Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	24,000.00

COMMERCIAL STATISTICS.

The present commerce of this stream is confined to the rafting of timber and logs. Not less than 60 per cent of the lumber exported from the port of Pensacola passes out of this river, the estimated valuation of which is $1,800,000. No accurate records of the timber business on the river are obtainable, and more detailed statistics can not be furnished.

While this improvement is not permanent, and an annual expenditure is necessary to maintain it, the river after each high water is in better condition than after previous floods; and with the improved plant now provided, the length of river worked over each season will be increased.

P 9.

IMPROVEMENT OF ALABAMA RIVER, ALABAMA.

PLAN OF IMPROVEMENT.

The present plan of improvement was adopted in accordance with the recommendations contained in the reports of examinations and partial surveys printed in the Annual Reports of the Chief of Engineers for 1876, p. 498, and for 1891, p. 1761.

The project provides for obtaining a low-water channel 6 feet deep from Wetumpka, Ala., to the junction with the Tombigbee River, 44 miles above Mobile, Ala., an estimated distance of 323 miles, by the removal of logs and snags from the channel and overhanging trees from the banks, by removing rock reefs and gravel bars by blasting and dredging, and deepening sand bars by works of contraction and shore protection, at an estimated cost (prior to the appropriation, July 2, 1892, of $70,000) of $386,251, exclusive of the cost of maintenance and snagging, estimated at $10,000 per year.

The normal width of the upper portion of the river is from 500 to 600 feet and of the lower portion from 700 to 800 feet. Where the river has the normal width the low-water depths in the channel vary from 8 to 15 feet; but where these widths have been increased by the erosion of the banks, shoals, bars, or reefs are found. The average slope of the low-water surface is about 4 inches per mile. The maintenance of an efficient stern-wheel snag boat is required to remove the logs and snags brought in by the winter freshets each year.

APPROPRIATIONS.

June 18, 1878	$25,000	August 5, 1886	$15,000
March 3, 1879	30,000	August 11, 1888	20,000
June 14, 1880	25,000	September 19, 1890	20,000
March 3, 1881	20,000	July 13, 1892	70,000
August 2, 1882	20,000		
July 5, 1884	10,000	Total	255,000

OPERATIONS TO JUNE 30, 1892.

Between 1878 and 1883 the average annual appropriations were $24,000, and with this amount considerable snagging work was done, and training dams, built of brush and stone, rock, or pile work and stone, were constructed at eight of the most troublesome bars, viz, the Cut-Off, Haines Island, Hobbs Island, Yellow Jacket, Gardner Island, Haduot, Cox, and Three Chutes. Between 1883 and 1892 the average annual appropriations of less than $10,000 only sufficed for the maintenance of an efficient stern-wheel snag boat for annual snagging operations. A great deal of useful work was, however, accomplished by the removal of logs and snags from the channel and by cutting the overhanging trees. Many of the shoal places in the river are caused by the accumulation of sand and gravel about sunken logs and snags, and a number of troublesome bars have been permanently improved simply by the removal of these obstructions.

WORK DONE DURING THE PAST FISCAL YEAR.

Assistant Engineer C. B. Percy, who has been in local charge of the work, reports as follows:

The snagging operations begun at the mouth of the river in May, 1892, were continued with the steam snag boat *W. J. Twining* to the junction of the Coosa and Tallapoosa rivers, this point being reached September 22, the work in the meanwhile being interrupted to an unusual extent by heavy and continuous rains and high water, which caused an absolute cessation of work during twenty-three days and greatly retarded it at other times. The channel, throughout the entire length of the river, having been practically cleared of logs, snags, etc., and the banks of the chutes of overhanging timber dangerous to navigation, snagging operations for this season were suspended and the party ordered to commence works of contraction in the lower river. During the spring of 1893 the steamer *Twining* was thoroughly overhauled and repainted and repaired, as far as possible, at Wetumpka, and on May 25 was put in commission, and after an inspection trip of the river made by the officer in charge was ordered to Mobile to have some necessary repairs to the boilers and chimneys. This work was completed June 8, but the stage of water being then too high the boat was detained in Mobile until June 15, when work was begun at the mouth. The number of snags found lodged in the channel was insignificant as compared with former years, and but little overhanging timber had to be removed. The entire river was worked over, and the junction of the Coosa and Tallapoosa rivers was reached on June 30, 1893. The total amount of work done during the fiscal year in the nature of snagging is given in tabulated statement below.

Works of contraction.—There being no plant on the Alabama River except the stern-wheel snag boat *W. J. Twining*, the steamer *Coosada* and two barges belonging to the lower Coosa River were temporaily turned over on July 1 to this improvement, and another barge was purchased. Incessant rains and high water prevented any work being started before July 27. In the mean time the repairs to the steamer *Coosada* were continued, the light-draft log boat belonging to the Cahaba River was fitted out as a pile-driver, and one of the Coosa River barges converted into a quarter boat for the rock and brush gangs and the purchased barge repaired. On July 27 Party No. 1 was organized and work was started at the *Three Chutes*, 2 miles below Montgomery, where Dam No. 1 across the upper chute was begun. It was built of piles in two rows, 10 feet apart in each row, and rows 8 feet apart. The space between the rows was filled with brush and cane weighted down with gravel in boxes, each box containing one-ninth of a cubic yard, sunk below low water. A layer of the brush was placed above the gravel boxes and then a coping of rock to a height of 2 feet. When completed the top of the dam will be 4 feet above low water. The rock was obtained from the banks of the river at Manack Island, 17 miles below. The length of the pile dam is 411 feet, with a wing composed entirely of rock extending down the island 112 feet. Below the island and opposite the middle chute, which was closed last year, the river is very broad and the channel very crooked. The minimum depth during the extreme low water of 1891 was 3 feet. To deepen the channel over the bar, a dam projecting from the west shore and then down the river across the original channel was built, similar in construction to Dam No. 1, except that a mattress of cane 20 feet wide was first woven and sunk with boxes of gravel, and the space between the piles filled with fascines of brush and cane weighted with boxes of gravel and a coping of stone. Its total length is 1,050 feet, with 90 feet at the shore end built entirely of rock. The crest of both bars was broken to a depth of 1 foot with a rake operated by the snag boat *Twining*.

Hadnot Bar, 13 miles below Montgomery, was the next locality improved. A flat bar here divides the river, and the minimum depth in the navigable chute was 3¼ feet across the shoal at its head. A dam constructed in 1881 across the chute, at the head of the bar, being virtually destroyed, another was built about feet lower down the chute. This dam was composed of a mattress 20 feet wide as a foundation. Poles not exceeding 4 inches diameter were wattled between the piles in each row, and the space between the rows of piles was filled with fascines of brush and boxes of gravel. Before the brush had been sufficiently weighted high water caused a break about 60 feet long, and the bottom was scoured to a depth of 16 feet. The opening was finally closed by constructing mattresses and sinking them with bags of gravel. This dam was left in an incomplete condition, as no stone coping could be placed upon it before the high-water season set in.

Manack Island Bar, 19 miles below Montgomery, was next improved; a dam of rock had been commenced during the previous year at this point across the head of the chute that runs behind the island. This year the work was continued, but the dam is now composed of a double row of piles having the space between filled with brush and bags of gravel to low water, and a coping of stone 2 feet above low water. This bar was also raked by the *Twining* to a depth of 1 foot. The original depth of water was 32 inches.

The channel at Tyus Bar, 45 miles below Montgomery, was improved by Party No. 1 by cleaning logs and snags out of the chute next the left bank and cutting the overhanging timber. This chute was afterwards used during the extreme low-water season.

A break next the bank in the dam at head of Gardner Island, 65 miles below Montgomery, was closed and the crest of the old rock dam at lower end removed to a depth of 1 foot.

The progress of the work by this party was very much retarded by rains and high water during August and September, by the difficulty in getting stone in such quantity and having to transport it so far, and also by having only one stone barge for a considerable time, one of the Coosa River barges having been returned September 1. The other, which was used as a quarter boat, was also returned October 1. The high-water season having set in, work was suspended December 8. All boats belonging to this fleet were taken to Wetumpka and there properly secured for the winter season.

Work of Party No. 2 in lower river.—Snagging operations being suspended September 22, the steamer *W. J. Twining* proceeded to Mobile for the two new quarter boats, two stone barges, and one brush barge that had been purchased in that city. Party No. 2 was organized and on September 29 the fleet left Mobile and reached Creek Shoals, 210 miles below Montgomery, October 1. Work at this point was begun October 3 on Dam No. 1, located at the head of the chute on the Hamilton Bluff side of the island. The *Twining* continued on up the river with one quarter boat and two barges in tow to Manack Island, to replace the barges that had been returned to the Coosa River improvement, and also to bring back the pile-driver for use at the Silver Creek work, returning there October 10. Dam No. 1, constructed at head of the island, was built entirely of rock obtained from Hamilton Bluff, about one-half mile above the site of the dam. The length of the dam proper is 572 feet, and it is extended down the island 396 feet. The shore end is protected by riprap for a distance of 112 feet, making a total length of 1,080 feet, with maximum height of 12 feet, slopes of 1 to 1½, and top width of 6 feet. During the progress of the work the bottom of the river and bar at the site scoured very rapidly, and to stop it mattresses of brush and bags of gravel were used with excellent results.

Below the island the width of the river is very considerably increased, and the channel was tortuous, and at extreme low water very difficult to navigate, having a depth of only 3 feet. To improve this locality, a longitudinal dam was constructed, projecting from the east bank and extending down the river across the original channel, with the view of throwing the axis of the current into the middle of the river, and against the bar on opposite side. This dam was constructed of piles in two parallel rows 6 feet apart. Fascines of brush were placed transversely and longitudinally in alternate layers weighted down with rock and bags of gravel, until the line of extreme low water was reached, when a coping of stone was put on to a height of 3½ feet. The shore end of the dam was built of rock; total length of dam was 872 feet.

Hamilton and Hurricane Bluffs, and Bell and Moseley landings, where there were large bowlders projecting from the bank, dangerous to boats making a landing, were cleared of all such obstructions.

The high-water season having set in, on December 9 party No. 2 was discharged and the *Twining* with the boats and barges were transferred to Wetumpka and secured with the upper fleet for the winter season.

When inspected at the close of the working season of 1892 the depth in the channel at Three Chutes Bar was found to have increased from 3 feet to 5½ feet, and the channel was straight below the island. At Hadnot Bar the minimum depth was found to have increased from 3½ to 5 feet; at Manack Island from 3 to 4½ feet; at Tyus Bar from 3½ feet to 4½ feet. Between Montgomery and Selma, a distance of 81 miles, the least depth at any point is now 4½ feet. The only point improved during 1892-'93 between Selma and the mouth was Silver Creek Shoals, and the depth here was found to have been increased from 3 feet to 5 feet, and the channel to be straightened.

Statement of work done during the fiscal year ending June 30, 1893.

Overhanging trees felled and cut up		1,506
Overhanging trees felled and pulled back		448
Overhanging trees trimmed		191
Logs on bank cut up		133
Stumps removed (leveled)		65
Snags removed from river		758
Brush placed in dams	cords..	931
Brush made into mattresses and placed	do....	644
Poles made into mattresses and placed	do....	738
Mattresses woven and placed	linear feet..	2,503
Piles driven		801
Rock quarried, picked, and placed on dams	cubic yards..	4,378
Gravel placed on dams	boxes..	1,063
Gravel placed on dams	bags..	2,983
Dams built	linear feet..	4,281
Shore protection built	do....	335
Rock bowlders removed from bank	cubic yards..	195
Rock bowlders removed from river	do....	35
Earth excavated	do....	319
Old dam rebuilt	linear feet..	75
Bars raked to depth of 1 foot	do....	1,675
Old dam lowered by removing 1 foot of height	do....	200

An inspection of the condition of the steamers *W. J. Twining* and *Coosada* was made in January, 1893; the former was found to need only some few repairs and repainting, but the hull of the latter was so decayed that it was deemed necessary to send it immediately to Mobile, to be docked. *Coosada* arrived at Mobile February 10, was immediately docked and repairs commenced. The steamer below the boiler deck was thoroughly repaired, and its entire machinery and boilers overhauled and repaired. This work was completed April 17, and the steamer was returned to Wetumpka when the work of remodeling the cabin and repairs to the upper works was continued and practically completed by June 30, 1893. The barges and pile-driver belonging to this improvement were also overhauled and repaired.

Two stone barges, two pile barges, and one pile-driver were purchased during the spring of 1893, for this improvement. The steamer *Coosada*, which has been repaired, and a complete outfit supplied from the Alabama River appropriation, is also used on this improvement.

RECOMMENDATIONS AND ESTIMATES.

When the appropriation of July 18, 1892, of $70,000, became available, the only plant on the river consisted of the sternwheel snag boat *Wm. J. Twining*. It has been, therefore, necessary to expend a large part of that appropriation in procuring the necessary plant for efficiently and economically carrying on the work of building training dams for the deepening of the shoal bars. An efficient working plant is now on hand for two working parties, one on the upper and the other on the lower river. Each plant consists of one stern-wheel tow boat, one quarters boat, one pile-driver barge, one small decked flat-boat for carrying piles, two stone barges, and one brush barge. With this plant the work will be continued vigorously during the low-water season of 1893, and the entire balance now available will be expended, except the small amount necessary to provide for the expenses of the care and preservation of the plant between the close of operations in the fall and the passage of the next river and harbor bill. It is very desirable, in the interest of economy, that sufficiently large appropriations shall be made to fully utilize the plant, by the employment of a large working force during the low-water season, and to complete the improvement as rapidly as practicable.

It is estimated that $150,000 can be profitably expended during the fiscal year ending June 30, 1895.

Money statement.

July 1, 1892, balance unexpended	$7,014.22
Amount appropriated by act approved July 13, 1892	70,000.00
	77,014.22
June 30, 1893, amount expended during fiscal year	38,272.39
July 1, 1893, balance unexpended	38,741.83
July 1, 1893, outstanding liabilities	8,111.91
July 1, 1893, balance available	30,629.92
Amount (estimated) required for completion of existing project, excluding cost of annual maintenance and snagging at $10,000 per year	336,251.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	150,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

COMMERCIAL STATISTICS.

The following statement of the business done by the steamboats named below during the fiscal year ending June 30, 1893, has been compiled from statements furnished by Capt. John Quill, of the steamers *Nettie Quill* and *Carrier*; by Capt. T. H. Moore, of the People's Line of Steamers; and by Capt. Owen Finnegan, of the *Alto*, whose steamboats run between Mobile and Montgomery, stopping at intermediate landings; and by Capt. R. Barry, of the steamboat *Minnie Lee*, a trading boat plying between Mobile and landings on the lower Alabama River.

Stern-wheel steamboats.	Registered tonnage.	Draft of water.		Round trips.	Between what points.	Passengers.
		Light.	Loaded.			
		Inches.	*Feet.*			
Nettie Quill	226.93	28	6.5	41	Mobile and Montgomery	5,400
Carrier	140.88	20	5.0			4,030
Tinsie Moore	198.29	24	5.5	43	Mobile and Montgomery	4,947
Barge "Tide"	320.01	12	4.5			
Alto	363.16	30	6.0	15	Mobile and Montgomery	50
Minnie Lee	98.00	22	6.0			

Freight carried.

Articles.		Quantity.	Tons.
Cotton	bales	48,574	12,129
Cotton seed	sacks	92,232	4,611
Fertilizers	sacks	61,574	2,759
Hides and skins	packages	811	202
Live stock	head	700	297
Lumber	feet	134,000	284
Staves	pieces	218,496	3,702
Provisions	packages	121,496	10,278
Grain	sacks	75,993	6,340
Miscellaneous freight	packages	141,741	21,979
Total weight			62,581

In addition to the commerce carried on by the above boats, the rafting business on the river is very large. Great quantities of sawed and hewed timber and logs are rafted annually, but no available records of this business are kept.

P 10.

IMPROVEMENT OF TALLAPOOSA RIVER, ALABAMA.

PLAN OF IMPROVEMENT.

The plan of improvement was adopted in accordance with the recommendations contained in the report of an examination and partial survey of the river, printed in the Annual Report of the Chief of Engineers for 1881, p. 1223.

The project provided for obtaining a navigable channel from its junction with the Coosa River (where the two rivers form the Alabama River) to the Tallassee Reefs, 2 miles below Tallassee, the head of navigation, a distance of 48 miles; the channel in open river to be 200 feet in width, with a least depth of 3 feet at low water, and in rock cuts to be 60 feet wide and 3 feet deep at low water; the improvement to be accomplished by the removal of snags, logs, etc., from the channel, cutting overhanging timber from the banks, excavating rock and gravel reefs, and deepening sand bars by works of contraction and shore protection.

APPROPRIATIONS.

August 2, 1882	$15,000
July 5, 1884	10,000
August 5, 1886	7,500
August 11, 1888	7,500
September 19, 1890	4,000
Total	44,000

OPERATIONS TO JUNE 30, 1892.

The appropriations had been expended in the building, equippin and keeping in repair of a snag boat (without motive power) with wh snagging operations were carried on during the low-water seaso The original accumulation of logs and snags was removed from t channel, and the most dangerous overhanging timber was cut dow between the mouth of the river and Cowle Ferry, a distance of 43 mile and the fresh obstructions annually brought in by the winter freshe were removed so far as the funds available permitted. It is not know that any commercial use was made of the improved channel.

WORK DONE DURING PAST FISCAL YEAR.

No work was done on the river during the fiscal year, except the ca and preservation of the plant belonging to the improvement, until i was transferred to the Alabama River improvement after the passa of the river and harbor bill of July 13, 1892, which contained no appro priation for continuing work on the Tallapoosa River.

RECOMMENDATIONS AND ESTIMATES.

From past experience it is not believed that any commercial bene will be derived from continuing the improvement of this river at pre ent, and no estimate is, therefore, submitted for the work.

Money statement.

July 1, 1892, balance unexpended	[illegible]
June 30, 1893, amount expended during fiscal year	[illegible]
July 1, 1893, balance unexpended	[illegible]
July 1, 1893, outstanding liabilities	[illegible]
July 1, 1893, balance available	[illegible]

COMMERCIAL STATISTICS.

During recent years there has been no attempt to operate steamboats on th river, and there is, consequently, no commerce to report.

The business on the river, so far as known, has been confined to rafting l sawed and hewed timber. No available records are kept of this business, and n reliable estimate of its amount can be made.

P II.

IMPROVEMENT OF COOSA RIVER, GEORGIA AND ALABAMA.

PLAN OF IMPROVEMENT.

Beginning at Mobile, Ala., the Mobile River, 44 miles long, the Ala bama River, 312 miles long, the Coosa River, 315 miles long, the Oost naula River, 60 miles long, and the Coosawattee, navigable for 45 mile form, in fact, one great river, which rises in northwestern Georgia an flows through the mineral fields of north Alabama, the agricultura belt of middle Alabama, and the timber region of south Alabama.

The Oostenaula and Coosawattee rivers, above Rome, Ga., are nav gable for light-draft boats during nine months of the year for a di tance of 105 miles. Below Rome the Coosa is navigable during the entire year a distance of 188 miles, to Lock No. 4, 3 miles above the Georgia Pacific Railroad Bridge. Between Lock No. 4 and Wetumpka, a distance of 116 miles, the navigation of the Coosa is obstructed by a series of rocky reefs and shoals, separated by stretches of good navigable water, varying in length from one-half to 8 miles. The total fall in the low-water surface of this section of the river is 323 feet. The low-water discharge at Wetumpka is 5,800 cubic feet, the same as that reported for the Mississippi River at St. Paul. Below Wetumpka the Coosa, Alabama, and Mobile rivers afford good navigation during the entire year to tidewater at Mobile Bay.

The present plan of improvement was adopted in accordance with the recommendations contained in the reports of the various examinations and surveys, which are printed in the annual reports of the Chief of Engineers for 1871, 1872, 1875, 1878, 1881, and 1890.

The project provides for the removal of the lesser rock shoals and sand and gravel bars by excavation and by works of contraction, and for the construction of locks and dams to overcome the more serious obstructions.

By the various acts making appropriations the river has been divided into two sections, and separate appropriations have been made for each section.

In the upper section, between Rome and the East Tennessee, Virginia and Georgia Railroad Bridge, a distance of 236 miles, eight locks, with their accessory dams, will be required. Of these, three have been completed, and the fourth is now under construction. The work is carried on downstream in order that the completion of each lock and dam may immediately open an additional section of the river to the steamboats now running on the upper river.

In the lower section, between Wetumpka and the East Tennessee, Virginia and Georgia Railroad Bridge, a distance of 68 miles, twenty-three locks, with their accessory dams, will be required. The first appropriation for this section of the river was made by the act of September 19, 1890, which required that the work should be commenced at Wetumpka.

1. BETWEEN ROME, GA., AND THE EAST TENNESSEE, VIRGINIA AND GEORGIA RAILROAD BRIDGE.

APPROPRIATIONS.

August 14, 1876	$30,000	August 5, 1886	$45,000
June 18, 1878	75,000	August 11, 1888	60,000
March 3, 1879	45,000	September 19, 1890	150,000
June 44, 1880	75,000	July 13, 1892	130,000
March 3, 1881	60,000		
August 2, 1882	83,700	Total	803,700
July 5, 1884	50,000		

OPERATIONS TO JUNE 30, 1893.

Between 1876 and 1881 the principal obstructions in the channel between Rome, Ga., and Greensport, Ala., had been removed and a number of bars and rocky reefs improved by regulation works and excavation in the rock. Steamboats then made regular trips between Rome and Gadsden, and occasional trips to Greensport, Ala.

Below Greensport, at distances, respectively, of 0.68, 3.86, and 5.24 miles, three masonry locks, each 40 feet wide by 210 feet between miter sills, with their accessory dams, had been completed and opened to navigation. During the year 1892 Dam No. 4, about 3 miles above Riverside, Ala., on the Georgia Pacific Railroad, had been nearly completed, and, with the work at Lonnergan Reef, made navigation practicable on a moderate rise in the river as far as the dam.

Dam No. 4 is 21 miles below Lock No. 3, and its distance from Rome is estimated to be 188.24 miles.

In the improved portions of the river during about nine months of the year there is 5 feet or more of water in the shoalest places, and for the remaining three months there is ordinarily 3 feet. The river is never closed by ice.

WORK DONE DURING PAST FISCAL YEAR.

Lieut. William E. Craighill, Corps of Engineers, U. S. Army, who has been in local charge of the improvement of this section of the river since June, 1891, submits the following report:

All work done on the river has been by hired labor. It has been carried on at two principal points, Lock No. 4 and Box Shoals (at the head of the pool of Dam No. 4).

At the beginning of the year work was suspended on account of lack of funds. On July 25, 1892, it was resumed under the new appropriation.

The work has been: (*a*) Completing the cofferdam and attempting to stop the leaks that developed in the rock bottom of the lock pit; (*b*) cutting stone for the masonry of the lock walls; (*c*) completing the main dam across the river; (*d*) preparations for completing the abutment by cutting the coping and protecting the bank below it.

(*a*) The length of cofferdam required to complete the inclosure of the lock was [illegible] feet. It consisted of two parallel rows of crib work with a clay core between. It was commenced on July 25, and brought to practical completion in October.

Details of the cost are as follows:

COFFERDAM.

Class of work.	Quantity.	Cost per unit.	Amount.
Crib work and sheet piling .... feet B. M.	206,404	$17.16	$3,54[illegible]
Clay filling .... cubic yards	6,621.25	.68	4,[illegible]
Paving .... do	321.18	2.01	6[illegible]
Engineering, superintendence, etc	....	....	1,1[illegible]
Total	....	....	9,[illegible]

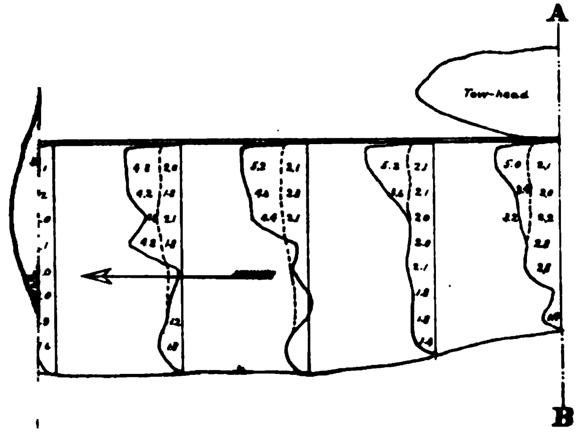
As soon as the pressure came upon the head of the cofferdam, several large leaks were developed in the bottom of the lock pit at its upper end. Examinations by a diver both inside and outside of the cofferdam were made, and showed that the leaks were generally deep seated, in holes or fissures in the rock. All openings outside the cofferdam that could be found by repeated search were stopped by the use of hay and similar material, and rock, gravel, and clay. By this means the flow into the lock pit was diminished, but not enough to allow it to be controlled by a reasonable amount of pumping plant.

As no more openings could be found outside, the effort was made to stop the orifices inside the lock pit with concrete, first allowing the water within to rise as nearly as possible to the level of the upper pool. By this means the leakage was still further reduced, but not sufficiently to allow the pumps (a 10-inch and an 8-inch centrifugal) to control it. A small portion of the area of the lock pit was then inclosed by a light cofferdam and the attempt made to pump it out, using for the purpose all the pumps available. These were a 10-inch, an 8-inch, and a 6-inch centrifugal pump.

This attempt proved unsuccessful, and authority was then asked to change the location of the lock by moving it downstream far enough to avoid the leaks, and at the same time avoid the necessity of having to contend against the pressure of the water in the upper pool.

The total amount expended on the leaks has been:

Stopping leaks and stock ramming	$6,539.15
Engineering and superintendence, etc	1,012.34
Total	7,551.49



COOSA RIVER ALA.

MAP OF
BOX SHOALS

100 200 300 400

Scale of Feet.

JUNE 1893.

U.S. Engineer Office,
Montgomery, Ala., June 30th 1893.
To accompany Annual Report for 1893.
Philip M. Price
Capt. Corps of Engineers.

NOTE.

Surface ‐‐‐‐‐‐‐‐

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Drawn by R.A. Chapman.

Photo-Lith. by A.

Eng 93

(*b*) A plan for the masonry of Lock No. 4 was submitted, and as soon as practicable after its approval, arrangements were made to have the work of quarrying and cutting stone needed for the lock commenced at a quarry on the river bank about 6 miles above the lock site.

There had already been cut 1,007.51 cubic yards at this quarry for the lock. This was brought down to the lock site and piled in the yard. At the end of the fiscal year the bill of stone for the lock, except the coping, is nearly complete.

The following is a statement of the cost, in detail, of the various classes of work:

QUARRYING.

Class of work.	Quantity.	Cost per unit.	Amount.
	Cubic yards.		
Stripping		$0.07	$368.05
Labor, quarrying	5,588.65	1.27	7,106.76
Material		.15	855.55
Engineering, superintendence, etc		.20	1,132.92
Total	5,588.65	1.69	9,463.28

CUTTING.

Class of work.	Quantity.	Cost per unit.	Amount.
	Cubic yards.		
Quarry-face ashlar	391.07	$8.80	$3,441.42
Pointed-face ashlar	593.81	10.50	6,235.00
Special dimension	101.26	11.28	1,142.11
Miter sill	141.66	17.65	2,500.30
Checks, ladder, and bulkhead	75.50	17.42	1,315.21
Circular corners	44.00	15.80	695.20
Hollow quoins	19.23	25.05	481.71
Wall coping	.79	12.00	9.48
Coping for west abutment	20.60	12.64	260.38
Material			1,074.30
Engineering, superintendence, etc			2,333.09
Total	1,387.92		19,488.20

DELIVERING.

Class of work.	Quantity.	Cost per unit.	Amount.
	Cubic yards.		
Stone previously cut and backing	1,133.05	$0.35	$396.57
Engineering, superintendence, etc			53.91
Total	1,133.05		450.48

The steamer *Annie M.*, of Gadsden, Ala., a stern-wheel towboat, was purchased and fitted up during the year.

During March 932 cubic yards of sand were loaded upon barges near Lock No. 2, and brought to Lock No. 4, and stored in the yard to be used for mortar.

(*c*) *Completing the main dam.*—The work to be done consisted in putting on the crest and repairing some damage that the dam had suffered during the previous winter on account of its unfinished state. This was commenced on August 13 and completed November 5, 1892, with several interruptions on account of high water. The following table gives the total cost of the dam, and includes $31,363.09 expended during the previous fiscal year:

MAIN DAM.

Class of work.	Quantity.	Cost per unit.	Amount.
Preparing foundation			$588.33
Crib work and sheet piling in place, including fastenings . feet, B. M.	531,024	$16.65	8,839.17
Stone filling . cubic yards	7,909.09	3.13	24,743.44
Engineering, superintendence, etc., during fiscal year ending June 30, 1893			822.18
Total			34,993.12

(*d*) The coping of the abutment has been cut except one piece. Four hundred and twelve and forty-nine one-hundredths cubic yards of stone was placed below the abutment as a shore protection.

Box shoals.—A drawing is transmitted herewith showing the present condition of this shoal and its condition before the improvement was commenced. It is an extensive reef of rock lying at the head of the pool of Dam No. 4. It is proposed to make a cut 100 feet wide through the rock to give a navigable depth of 4 feet at low water. The work was in progress at the beginning of the fiscal year, having been commenced the preceding May. Since November 18, 1892, the channel has been in use, but it has not yet been completed to its full width and depth throughout. The material excavated was placed so as to form a training dam on the outer edge of the channel. Some waste stone was also brought from Collins Spring Quarry for this dam. By building the upper end of the dam first and throwing a light trestle dam across the head of the cut, the water was lowered sufficiently to make it possible to do a large part of the excavation nearly dry. Three steam drills were used in addition to a force of hand drillers. After the dipper dredge was finished, it was used to remove the material excavated. The following table gives the cost of the work up to date, and includes $1,290.25 expended during the previous fiscal year:

BOX SHOALS.

Class of work.	Quantity.	Cost per unit.	Amount.
	Cu. yds.		
Rock excavation, including deposit of stone in training dam	3,208	$3.10	$9,934.9
Engineering, superintendence, etc		.36⅔	1,176
Total	3,208	3.46⅔	11,110.3

A small amount of work has been done at three other small shoals between Locks Nos. 3 and 4, and is in progress at the end of the fiscal year. The work required consists principally in removing bowlders and projecting points of rock, except at one point where a cut of about 50 feet in solid rock will be required.

On March 11, 1893, Assistant Engineer D. M. Andrews made an observation upon Polaris at elongation to determine and mark upon the ground the true meridian at Lock No. 4. The variation of the needle was determined to be 2° east.

The following is a statement of expenses during the fiscal year ending June 30, 1893:

1.	Channel work, between locks Nos. 3 and 4		$10,259.17
2.	Coffer dam for Lock No. 4, including stopping leaks		15,279.83
3.	Quarrying and cutting stone for Lock No. 4, and transportation of stone already cut		25,882.08
4.	Other work of preparation for masonry of Lock No. 4		6,010.84
5.	Coping of the west abutment and shore protection below it		857.01
6.	Completing and repairing Dam No. 4		2,807.85
7.	Purchase of plant as follows:		
	Steamer *Annie M.*, and 3 barges	$8,000.00	
	Manila rope	651.48	
	Tackle blocks	127.50	
	Pipe fittings	104.42	
	Horse powers	760.00	
	Pumping engine and pump	778.75	
	Steam drills	588.00	
	Hoisting engine	397.00	
	Miscellaneous articles of property on the property list	1,059.00	
			12,466.15
8.	Repairs, maintenance, and operating towboat		6,041.34
9.	Office expenses, superintendence, and items not specially chargeable to any work		9,545.98
10.	Expenses, Montgomery office		1,185.00
11.	Recording gauge at Lock No. 5		60.00
12.	Material on hand and unfinished cut stone		236.60
13.	Sundry small amounts belonging to work of previous years		291.74
	Total		90,921.35

RECOMMENDATIONS AND ESTIMATES.

A work of this magnitude can be carried on much more economically and completed at a much less ultimate cost with large appropriations, which will enable the work to proceed without interruption, and with efficient plant and a large working force.

The balance now available will all be expended by June 30, 1894, in continuing the improvement of the channel between locks Nos. 3 and 4, and in the construction of Lock No. 4, but will not be sufficient to complete laying all the masonry.

Should the new appropriation be sufficiently large, it is expected that Lock No. 4 can be completed and opened to navigation, and work begun on one or more of the locks to be built below it, during the year ending June 30, 1895.

Money statement.

July 1, 1892, balance unexpended	$5,855.77
Amount appropriated by act approved July 13, 1892	130,000.00
	135,855.77
June 30, 1893, amount expended during fiscal year	85,563.21
July 1, 1893, balance unexpended	50,292.56
July 1, 1893, outstanding liabilities	8,844.08
July 1, 1893, balance available	41,448.48
Amount (estimated) required for completion of existing project	960,133.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	600,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

COMMERCIAL STATISTICS.

Reported by the White Star Line Steamboat Company and the Lathrop-Hatten Lumber Company, of Riverside, Ala. The statistics of the lumber business are not complete. It has not been practicable to obtain a statement of the rafting done by other lumber companies and private individuals.

Stern-wheel steamboat.	Registered tonnage.	Draft of water.		Round trips.	Between what places.	Passengers.
		Light.	Loaded.			
		Inches.	*Inches.*			
Clifford B. Seay	115.80	19	52	65	Rome, Ga., and Gadsden, Ala.; Greensport and locks 1, 2, 3, and 4, Ala.	1,350
Resaca				28	do	580

Freight carried.

Articles.		Quantity.	Tons.
Cotton	bales	18,000	4,400
Cotton seed	sacks	16,000	800
Fertilizers	do	17,000	1,700
Hides and skins	packages	200	11
Live stock	head	150	60
Lumber	feet	7,000,000	17,000
Rafted timber and logs	do	8,000,000	18,000
Staves	pieces	2,500,000	2,100
Provisions	packages	28,000	1,700
Grain	sacks	60.000	3,200
Miscellaneous freight	packages	50,000	6,500
Total			55,471

Estimated value of above freights (in round numbers), $1,480,000.

In forwarding the statistics the president of the Lathrop-Hatten Lumber Company remarks:

"The delay of work at Lock 4 costs our company $10 per day in having to break up our rafts and keeping a crew of men at that point to roll logs over, and also the attendant sinkage of yellow pine logs. We earnestly pray that the work may be prosecuted with all possible haste in order that timber and lumber may be manufactured in this part of the State as cheaply and as economically as elsewhere, while the matter of transporting iron and coal by this route to Montgomery, Mobile, and the coast is a matter of history, and we regard it as of the utmost importance to the State and nation."

2. BETWEEN WETUMPKA, ALA., AND THE EAST TENNESSEE, VIRGINIA AND GEORGIA RAILROAD BRIDGE.

APPROPRIATIONS.

September 19, 1890	$150,000
July 13, 1892	100,000

OPERATIONS TO JUNE 30, 1892.

In October, 1890, a party was organized and stationed at Wetumpka to make the detailed surveys necessary for the precise location of Locks Nos. 31, 30, and 29, and to make a series of velocity and discharge measurements at all stages of the river from low to high water. The party was engaged in this work during the remainder of the fiscal year.

Actual work of improvement of this section of the river was begun September 7, 1891, and by June 30, 1892, a yard had been made at the site of Lock No. 31 by depositing about 6,000 cubic yards of earth and rock (removed in connection with the channel work in the river) in the gully which occupied the greater part of the area. A temporary breakwater of loose rock was constructed in the channel of the river in order to deflect the current from the proposed site of the cofferdam. Most of the necessary workshops, shed, etc., were erected. Two barges for the conveyance of sand were built, and an inclined railway and sand-storage bin constructed. Rock excavation in the channel above the lock was commenced in October, 1891, and 2,786 cubic yards removed before the end of the fiscal year. Detailed surveys were made for the location of Locks Nos. 29 and 30, and for the location of a channel through Moccasin Reef, between these two locks. A contract had been entered into for the supply of about 900 cubic yards of cut stone for the face of the walls of Lock No. 31, but only about 35 cubic yards had been delivered.

WORK DONE DURING PAST FISCAL YEAR.

Assistant Engineer Charles Firth, in local charge of the work on this section of the river, reports as follows:

Operations during the year have been confined to the site of Lock No. 31, and to the channel work at the head of the rapids above the lock; the work at both points has been very much delayed and complicated by the succession of floods in this portion of the river, caused by the excessive rainfall throughout the year. On nine distinct occasions the river has risen to a sufficiently high stage to compel the entire suspension of all work in the bed of the river; the longest time over which this condition extended, without intermission, was from November 6, 1892, to June 21, 1893, with the exception of four days toward the end of May. The maximum height attained was 46 feet above low water.

From the fact that several individuals laid claim to the land which it was necessary to acquire as a lock yard, and none of the claimants could produce a clear title to the same, it was thought advisable to acquire such title by condemnation proceedings, which was accordingly done in the United States district court for the middle district of Alabama in July, 1892. The title was finally approved and the amount of award, $1,000, was paid into the said court on March 16, 1893.

The construction of the lock keeper's house, which it was proposed to use temporarily as an office and quarters, was proceeded with as soon as the land was condemned, and was completed and occupied by November 4, 1892.

The principal work of the season at the lock site was the partial construction of the cofferdam, which was commenced on August 14, 1892; but it was washed out or otherwise damaged by floods three times during the first few weeks after commencement. By November 5 the head wall of the cofferdam was so far advanced that two days more would have been sufficient to complete it, but heavy rains set in, and the river again rose so rapidly that the divers, who were completing the sheathing of the cribs, could not keep their feet, and before other means could be adopted four bays of sheathing, which were not yet backed up by the clay filling, were forced in by the rush of water. The dam was weighted down with all the weight that could be gotten on to it, but as the river rose the unfilled portion of the dam gradually slid downstream until it finally stopped about 2 feet out of line with the ends. As soon as an examination could be made it was found that the sheathing all along the dam, which before was made a perfect fit with the inequalities of the rocky bottom, had been torn from the crib timbers; this was patched up and a toe of bags, filled with puddled clay, was formed along the inside of the core, but it is doubtful whether the dam will ever be as tight as it was before the slip took place. It was found impossible to again make tight the sheathing of the outer wall of the outside cribs, so it was decided to fill the whole of the outer cribs with stone. The clay filling for the inside crib and the core of the cofferdam was obtained from the river bank a short distance below the lock, and a railroad track of 36 inches gauge built between the two points, a small tank locomotive purchased, and 15 dump cars built to transport the material. All work on the cofferdam was suspended for the season on December 13, 380 linear feet out of the total of 900 feet having been completed. On May 22, 1893, the work was recommenced, but the river rose again on the 29th and necessitated another suspension of the work till June 21, 1893.

The work sustained practically no injury during the high-water season.

During the previous fiscal year a contract was entered into with Mr. Frank Baldwin, of Birmingham, Ala., to supply and deliver about 900 cubic yards of cut stone for facing walls of the lock above low-water level. Up to May 5, 1892, the time of the expiration of the contract, only 35 cubic yards of this stone had been delivered, and an extension of time to September 30, 1892, was asked for and granted; during this extension about 170 additional yards were shipped from the quarry in two consignments, but as the contractor has not yet paid the freight charges on either consignment, as specified in the contract, the stone is still in the hands of the railroad company. Owing to the delay and apparent inability on the part of the contractor to complete his contract, the annulment of the same was recommended, and approved by the Chief of Engineers; and it was decided to abandon the use of cut stone in the lock walls, except for the hollow quoins, and adopt instead a facing of a superior quality of concrete to that forming the bulk of the wall.

When the adoption of concrete walls was approved, it was intended to obtain the necessary sand from a bar in the Alabama River, about 15 miles below Wetumpka, but on entering into negotiations with the owner of the adjoining property, who, under the law, is also the owner of the bar, such an exorbitant price was asked for the sand that it was decided to look elsewhere for it. An examination of the bed of the river immediately below the lock site resulted in the discovery of a large deposit of good sand and gravel suitable for concrete. By authority of the Chief of Engineers a dredge boat was built on the works during the high-water season, and a sand-pumping outfit purchased from the Morris Machine Works, of Baldwinsville, N. Y. The whole was completed by March 23, 1893, but the dredge was not put to work till May 18, owing to high water. She has since been working intermittently clearing sand and other deposit from the line of the cofferdam. Drawings and specifications have been prepared for the erection of a cement house and concrete mixing and distributing plant. Proposals for the supply and the delivery of the necessary machinery for the same were asked for by advertisement and opened on June 24th. The total of the lowest bids for the different items amounted to $3,054.00 + about $19.50 for rope, and their acceptance was recommended.

The materials for the construction of the building have been purchased, and it is now being erected.

Proposals have been asked for by advertisement for the supply and delivery of the quoins and other special stones required for the lock. The proposals are to be opened on July 18, 1893.

Rock excavation for a channel of 6 feet depth, through the large reef at the head of Wetumpka Rapids, about half a mile above the site of Lock No. 31, progressed favorably throughout the year, except during the winter suspension, from December 20, 1892, to May 17, 1893, although considerable trouble and delay was caused near the beginning and end of that period by sudden floods, which sometimes did considerable damage to the plant.

At the beginning of the fiscal year an inclined railway was built from the surface of the reef to the top of the bank; this is operated by a hoisting engine, which hauls the loaded cars up; they are then run along the edge of the bank and dumped, thus using the waste material or soft rock as a protection to the caving bank. The harder rock, which is found embedded in the other in the form of bowlders, is loaded on scale boards, which are hauled up the incline on flat cars, the scale boards being then lifted by a derrick, operated by the hoisting engine, and deposited on a platform near by, under which stands a No. 3 Gates rock-breaker; the broken stone falls into a screen, and thence into a car, which deposits it into storage bins for future use in concrete; the screened material will be used for finer concrete for exposed surfaces.

Statement of cost of work during fiscal year ending June 30, 1893.

[Including outstanding liabilities of $5,058.70, and excluding $9,785.47 of liabilities of June 30, 1892, paid during the year.]

Construction of cofferdam, Lock No. 31 (unfinished)	$17,677.94
Rock excavation in channel, 6,266 cubic yards, at $1.60	10,025.60
Plant and tools purchased	9,089.98
Engineering and superintendence not properly chargeable to any particular work, office rent, firewood, etc	4,109.70
Lock keeper's house	3,061.51
Dredge boat and pumping machinery complete	2,843.47
Cement house (unfinished)	1,219.94
Rent and purchase of land, Lock No. 31	1,127.13
Sundry repairs and alterations to plant and tools	943.81
Construction of crushed-stone bins	930.13
Subsistence and forage	926.30
Workshops, sheds, stone yard, traveler, etc	854.73
Care of property during high water	682.10
Stone crushed and stored, 561 cubic yards, at 94 cents	527.34
Repairs to steamer *Coosada*	449.31
Inclined railway and storage bin	443.00
Sand pumped from site of cofferdam and stored, 1,031 cubic yards, at 40 cents	412.40
Filling and grading lock yard	210.50
Recording gauges	207.70
Rent of telephones	147.00
Expense connected with cut-stone contract (inspection)	138.36
Blue printing and photographing room and materials	144.83
Traveling expenses	82.60
Bridge and ferry tolls	47.50
Montgomery office expenses	1,902.86
Total	58,205.74

RECOMMENDATIONS AND ESTIMATES.

When this work was begun, in 1891, as an entirely new work, there was no plant nor material of any kind on hand. A very complete working force and plant have now been obtained for the construction of Lock No. 31, which is to be built of concrete, and it is expected that the lock can be built very rapidly as soon as the cofferdam is completed, and that the balance of the appropriation now available will be exhausted by June 30, 1894.

Should the new appropriation be sufficient, the construction of Locks Nos. 30 and 29 will be begun with it. Nearly all the plant which has been bought for the construction of Lock No. 31 will be transferred successively to the locks above it, and the cost of building these locks will therefore be considerably less than that of building Lock No. 31.

An improvement of this magnitude can be carried on economically and completed within a reasonable time only by the appropriation of sufficiently large amounts to enable the work to proceed without interruption on account of lack of funds.

Money statement.

July 1, 1892, balance unexpended		$104,736.06
Amount appropriated by act approved July 13, 1892		100,000.00
		204,736.06
June 30, 1893, amount expended during fiscal year		62,937.51
July 1, 1893, balance unexpended		141,798.55
July 1, 1893 outstanding liabilities	$5,053.70	
July 1, 1893, amount covered by uncompleted contracts authorized but not yet executed	3,073.50	
		8,127.20
July 1, 1893, balance available		133,671.35
Amount (estimated) required for completion of existing project		4,843,074.00
Amount that can be profitably expended in fiscal year ending June 30, 1895		600,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Abstract of bids received by Capt. Philip M. Price, Corps of Engineers, for furnishing machinery for a concrete mixing and distributing plant at Wetumpka, Ala., (improving Coosa River, Georgia and Alabama, between Wetumpka and East Tennessee, Virginia, and Georgia Railroad Bridge) and opened on June 24, 1893.

Number.	Name and address of bidder.	Item A—Two concrete mixers.	Item B—One Cement elevator.	Item C—One horizontal engine.	Item D—Two cages for elevator.	Item E—One gravity hoisting drum.	Item F—Twelve dump cars for concrete.	Item G—Four dump cars for sand.	Item H—Four dump cars for broken stone.	Total.
1	Steffner & Sloan, Chattanooga, Tenn. *a*	....	....	$490.00	....	....	....	....	....	....
2	J. H. Day & Co, Cincinnati, Ohio *b*	$943.68	$276.28	....	....	....	$3,773.80	....	....	....
3	S. C. Forsaith Machine Co., Manchester, N. H. *c*	1,325.00	203.51	418.00	$190.00	$495.00	1,716.00	....	....	....
4	The Manhattan Supply Co., New York, N. Y. *d*	640.00	....	447.00	....	....	1,764.00	$348.00	$500.00	....
5	Rodgers, Haller, & Farrel, Cincinnati, Ohio *e*	*750.00	160.60	*360.00	....	....	1,350.00	....	....	....
6	Ryan-McDonald Manufacturing Co., Baltimore, Md. *f*	....	....	....	170.00	510.00	*936.00	*252.00	*292.00	....
7	Thos. Carlin's Sons, Allegheny, Pa. *g*	981.00	*153.50	393.40	*105.50	*†205.00	1,185.50	283.00	390.00	$3,696.90

a No guarantee and no justification of guarantors. Delivery five days, Chattanooga.

b All delivered in sixty days from receipt of notification.

c Delivery, forty-two days.

d Delivery, sixty days.

e Engine, twenty days; balance, sixty days.

f Delivery, forty days.

g Delivery: Item A, forty days; item B, twenty days; item C, fifteen days; item D, twenty-five days; item E, fourteen days; item F, thirty-five days; item G, twenty-eight days; item H, twenty-eight days.

* Recommended for acceptance. Total, $3,054.

† About 150 feet wire rope, at 13 cents per foot, $19.50.

COMMERCIAL STATISTICS.

On March 15, 1887, the Coosa River Improvement Convention, composed of representative citizens of Alabama and Georgia, and presided over by the governor of Alabama, assembled at Montgomery and prepared a memorial to Congress.

The memorial contains detailed statistics, and after describing the advantages to be derived from the improvement of the Coosa River, concludes with the following summary:

"The Coosa River presents the cheapest and most certain water route to the Gulf of Mexico of the coal, iron, cotton, and cereals of a vast extent of country.

"The removal of the obstructions which cut in half this river, now navigable for hundreds of miles below and above such obstructions, is a national duty, in view of the commerce it would pour into the Gulf of Mexico. The opening of the Coosa would enable the Government to move munitions of war from the interior to the seaboard safely and expeditiously.

"It would place the navigable waters of the Coosa so close to the navigable waters of the Tennessee that water communication between the two streams must certainly follow, and thus afford the Tennessee River and its vast tributaries an outlet to the gulf by way of the bay of Mobile."

P 12.

OPERATING AND CARE OF CANALS AND OTHER WORKS OF NAVIGATION ON COOSA RIVER, GEORGIA AND ALABAMA.

The expenses of operating and care of Locks Nos. 1, 2, and 3, and canal between Locks Nos. 2 and 3, during the past fiscal year have been paid in the manner indicated by section 4, act of July 5, 1884.

Lieut. William E. Craighill, Corps of Engineers, has been in local charge of the work, and reports as follows:

The locks have been in operation throughout the year, without accidents or serious delays, except that on August 18, 1892, the maneuvering gear of the upper gates at Lock No. 2 was broken by a steamboat striking one of the gates with her wheel. These gates have since been maneuvered by hand tackle. A new set of gear of the spar and capstan type has been ordered, but not yet received, from the manufacturers.

Repairs and improvements have been as follows:

A wire fence, with oak posts and top and bottom rails, was put up on the boundary line of the reservation at all the locks.

Seven latches for the valves were received and placed; two at Lock No. 1, one at Lock No. 2, and four at Lock No. 3. A drawing showing details of one latch is herewith.

The machinery for one three-fourths yard dipper dredge was purchased from the Osgood Dredge Company, and the hull was built and the machinery placed by hired labor.

As required by law, the following statement of expenses is submitted:

Statement of the expenses incurred during the fiscal year ending June 30, 1893, in operating and keeping in repair Locks Nos. 1, 2, and 3, and the canal between Locks Nos. 2 and 3, Coosa River, Georgia and Alabama.

[Including outstanding liabilities June 30, 1893, and excluding the sum of $626.20, paid in settlement of outstanding liability of fiscal year ending June 30, 1892.]

Lock No. 1:		
Lock-keepers' salary, twelve months, at $50	$600.00	
Labor, fitting on latches for valves	28.00	
Oak lumber and fencing	54.44	
Nails and staples	3.05	
Labor, building fence	166.12	
Paints, oils, and whitewash	20.27	
		$871.88

Statement of the expenses incurred during the fiscal year ending June 30, 1893, in operating and keeping in repair Locks Nos. 1, 2, and 3, etc.—Continued.

Lock No. 2:		
Lock-keeper's salary, 12 months, at $50	$600.00	
Labor, fitting on latches for valves	12.00	
Oak lumber for fencing	22.56	
Nails and staples	1.25	
Labor, building fence	41.75	
Maneuvering gear for upper gates	125.00	
Paints, oils, and whitewash	20.26	
		$822.8
Lock No. 3:		
Lock-keeper's salary, 12 months, at $50	600.00	
Labor, fitting on latches for valves	46.50	
Oak lumber for fencing	33.42	
Nails and staples	1.85	
Labor, building fence	93.00	
Paints, oils, and whitewash	20.27	
		795.0
Dredge:		
Machinery, delivered	4,964.42	
Lumber for scow	367.08	
Hardware	132.88	
Labor, building scow and fitting on machinery	1,083.84	
		6,548.2
Miscellaneous:		
Diving dress and fittings	46.46	
Transportation of funds	2.05	
		48.5
Total		9,086.4

Money statement.

July 1, 1892, balance unexpended	$637.5
July 8, 1892, allotment	10,531.7
Available for fiscal year ending June 30, 1893	11,169.2
June 30, 1893, expended during fiscal year	9,366,5
June 30, 1893, balance unexpended	1,802.7
June 30, 1893, outstanding liabilities	346.2
June 30, 1893, balance available	1,456.5

P 13.

IMPROVEMENT OF CAHABA RIVER, ALABAMA.

PLAN OF IMPROVEMENT.

The present plan of improvement was adopted in accordance with th recommendations contained in the reports of surveys and examination printed in the Annual Reports of the Chief of Engineers for 1875, p 11, and for 1881, p. 1232.

The project contemplates obtaining a navigable channel from it mouth to the town of Centerville, a distance of 88 miles, by the remova of snags, logs, etc., from the channel, cutting overhanging trees fro the banks, excavating the soft rock and gravel bars, and deepenin sand bars by works of contraction and shore protection, the channe to be 3 feet deep at low water, 100 feet wide in open river, and 60 fee wide through the bars.

Above Centerville the river is a series of pools and rapids, having fall of 109.2 feet in 21 miles. This portion of the river passes throug the extensive Cahaba coal fields, but can only be made navigable by system of locks and dams. Below Centerville the river is a series of pools and rapids, having a fall of 127.4 feet in 88 miles.

The act of August 5, 1886, appropriated $7,000 for continuing the improvement, but with the proviso that "no part of said sum shall be expended until the officer in charge shall have reported that the railroad and other bridges crossing said river have been provided with good and suitable draw openings." No changes had in the meantime been made in the bridges, but the act of September 19, 1890, provided that "the existing provision restricting the expenditure of the balance now available for the improvement of said river is hereby repealed, and the said balance shall be expended in continuing the improvement thereof."

APPROPRIATIONS.

August 2, 1882	$20,000
July 5, 1884	10,000
August 5, 1886	7,500
July 13, 1892	7,500
Total	45,000

OPERATIONS TO JUNE 30, 1892.

The appropriations to June 30, 1886, amounted to $30,000, and with this amount it had been practicable to build and equip a moderately efficient working plant, and to improve the river according to the project adopted from the mouth to a point below the bridge of the Alabama Central Division of the East Tennessee, Virginia and Georgia Railroad, a distance of about 19½ miles, and to make a partial improvement of the river to Centerville for high-water navigation by cutting overhanging timber.

Between June 30, 1886, and June 30, 1892, the sum of $8,430.44 was expended. In the spring of 1891 operations on the river were resumed. A log boat suitable for snagging operations was built, and employed during the following summer in snagging operations below Wallace Ferry.

WORK DONE DURING THE PAST FISCAL YEAR.

Assistant Engineer C. B. Percy, in local charge of the improvement, reports as follows:

The act approved July 13, 1892, having appropriated $7,500 for continuing the improvement, work was resumed August 5, 1892, at the mouth of the river. The snag boat originally belonging to the Tallapoosa River was substituted, by authority of the Chief of Engineers, for the log boat belonging to the Cahaba River, the latter having been fitted up as a pile-driver for use upon the Alabama River. Operations were continued with but little interruption until December 8, when they were suspended on account of high water, and the boat was towed to Wetumpka and laid up at that point for the winter season with the Alabama River plant. The work performed during the year ending June 30, 1893, comprised the removal of snags and other obstructions from the channel, and overhanging trees, large logs, and drift from the banks, and cutting stumps level with the ground, to a point 21¼ miles above the mouth and within one-fourth mile of the East Tennessee, Virginia and Georgia Railroad bridge.

Overhanging trees felled and cut up	4,489
Overhanging trees felled and pulled back	610
Overhanging trees trimmed	101
Large logs on bank cut up	534
Stumps on bank cut level	344
Snags and large trees removed from channel	1,098
Rock removed from channel ... cubic yards	23
Old railroad-bridge truss removed from channel	1

During the spring of 1893 the snag boat *Cahaba* was overhauled, repa
painted, and the arrangement of cabin on lower deck was so altered as t
ter facilities for the proper care of property and also furnish more
quarters for the crew.

At the close of work in December, 1892, the river was navigable for
steamers, on a rise of 2 feet above low water, for a distance of 21½ miles
nel being free of overhanging timber and of logs and snags; but owing
mingham, Selma and New Orleans Railroad bridge, which crosses the r
miles above the mouth, having no draw, no navigation has been attem
21½ miles above the mouth to Centerville, the head of navigation, a dis
miles, no work on the channel has been done, except for a short dista
consequently it is full of large snags, trees, and drift piles, completely
the river except at a high stage.

It is recommended that in the event of further appropriations for a c
of this improvement the log boat belonging to the Cahaba River be cha
self-propelling boat, as a very large percentage of the cost of the work i
slow method of moving the boat upstream by warping.

RECOMMENDATIONS AND ESTIMATES.

Navigation on this river is now completely blocked by the
the Birmingham, Selma and New Orleans Railroad, about
above the mouth of the river, and by the bridge of the Alal
tral Division of the East Tennessee, Virginia and Georgia ra
miles above the mouth. On March 31, 1892, this fact was re
me, in conformity with section 11 of the act of September 10,
by indorsement of April 8, 1892, I was directed to grant a h
each of the railroad companies in accordance with the instru
the War Department of December 16, 1891. My report of th
was made by fourth indorsement, dated September 2, 189
original report. In this report it is stated that—

> On June 2 the attorneys of the corporations were again present, but n
> ation was received from the parties supposed to be desirous of havin
> opened. At this hearing the attorneys submitted additional affidavit
> asked permission to take all the papers submitted by them for the purpos
> them printed.
>
> * * * * * *
>
> It has been generally known in that section of country for several mont
> the question of compelling the railroad companies to place draws in the
> in order to open the river to navigation, was being considered, and that t
> companies were opposing the measure, but not one word has been recei
> office in favor of such opening. This may be attributed either to apathy
> ject or to disinclination to antagonize the railroads, on which the coun
> dependent for transportation. I have no means of forming an opinion as
> velopment of steamboat navigation if the bridges are provided with dra
> the snags and overhanging timber have been cleared from the chann
> steamboats can use the lower river at stages of 4 to 5 feet above low wat
> about eight months of the year) if the draws are put in the bridges.
> doubtful if satisfactory low-water navigation can be secured without u
> and dams below as well as above Centerville.

So far as I know, no further action has been taken in rega
obstructing bridges.

As no commercial benefit can be derived from continuing
provement of the river while the bridges obstruct steamboa
tion, and as there is no apparent desire on the part of those i
to compel the placing of draws in the bridges, I do not cons
any money can be profitably expended on the improvement in
year ending June 30, 1895, and consequently submit no estima
for.

Money statement.

July 1, 1892, balance unexpended	$79.77
Amount appropriated by act approved July 13, 1892	7,500.00
	7,579.77
June 30, 1893, amount expended during fiscal year	3,610.31
July 1, 1893, balance unexpended	3,969.46
July 1, 1893, outstanding liabilities	153.28
July 1, 1893, balance available	3,816.18

COMMERCIAL STATISTICS.

No steamboats have navigated this river for many years past, and no effort to do so can be made, except on the lower 10 miles, while the two railroad bridges remain without draw openings.

Before the construction of the two railroads across the river the entire cotton crop of the Cahaba Valley was flat-boated to the Alabama River, but since then, owing to the obstructing bridges and the bad condition of the river, navigation by craft of any kind has been practically abandoned.

A large amount of sawn and hewn timber and saw logs of oak, cypress, and pine is annually rafted out of the river to Mobile, Ala., via the Alabama River, but no available records are kept of this business, and its amount can not be estimated.

P 14.

PRELIMINARY EXAMINATION OF THE BAR AT THE MOUTH OF ALAQUA BAYOU, FLORIDA, AT ITS ENTRANCE INTO CHOCTAWHATCHEE BAY.

[Printed in House Ex. Doc. No. 86, Fifty-second Congress, second session.]

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 5, 1892.

SIR: I have the honor to submit herewith a copy of report, dated September 16, 1892, by Capt. Philip M. Price, Corps of Engineers, of the results of a preliminary examination of the bar at the mouth of Alaqua Bayou, Florida, at its entrance into Choctawhatchee Bay, made to comply with provisions of the river and harbor act approved July 13, 1892.

Capt. Price reports that the locality is, in his opinion, not worthy of improvement at this time by the General Government, and his opinion is concurred in by the division engineer and by this office.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

Hon. S. B. ELKINS,
Secretary of War.

REPORT OF CAPT. PHILIP M. PRICE, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Montgomery, Ala., September 16, 1892

GENERAL: In accordance with the provisions of the river and h bor act of July 13, 1892, and of the letter from your office of July 1892, I have the honor to submit the following report of a prelimin examination of Alaqua Bayou, Fla.

The examination was made in August, 1892, by Assistant Engin J. E. Turtle, whose report is forwarded herewith.

Alaqua Bayou is an indentation of the north shore of Chocta hatchee Bay, about 60 miles east of Pensacola.

Assistant Engineer Turtle reports that one sawmill is situated Alaqua Creek, an affluent of the bayou, and another on the bayou its The product of these mills is transported to Pensacola in sailing scho ers and in barges towed by tugs. The depth of water on the bar the mouth of the bayou varies from 3½ to 4½ feet, according to the ti The barges are capable of being loaded to draw 5 feet, and con quently now only carry partial loads. The owners of the sawmills sire that the bar should be dredged to a depth sufficient to accomm date the barges when fully loaded. The commerce of the bayou c sists entirely of the products of the sawmills, and of the supplies provisions, etc., taken there for the employés of the mills. * * *

The improvement would only benefit the owners of the sawmills, a would not be likely to increase the commerce of that section of count to any appreciable extent.

In my opinion, Alaqua Bayou is not worthy of improvement at t time by the United States.

Very respectfully, your obedient servant,

PHILIP M. PRICE,
Captain, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. C. B. Comstock, Corps of Engineers, Division En neer, Southwest Division.)

[First indorsement.]

U. S. ENGINEER OFFICE,
SOUTHWEST DIVISION,
New York, September 21, 1892.

Respectfully forwarded to the Chief of Engineers.

I concur in the opinion of Capt. Price that this bar is not worthy improvement by the General Government.

C. B. COMSTOCK,
Colonel of Engineers, Bvt. Brig. Gen., U. S. A.,
Division Engineer.

REPORT OF MR. J. E. TURTLE, ASSISTANT ENGINEER.

HOLMES POST-OFFICE, FLA., *September 7, 1892.*

CAPTAIN: In compliance with your instructions of July 16, 1892, I have made t preliminary examination of the bar at the mouth of Alaqua Bayou provided for the river and harbor act of July 13, 1892, and have the honor to submit the follo ing report thereon:

Alaqua Creek heads in the upper end of Walton County, flows in a southerly dire tion, and empties into the bayou of the same name about three-fourths of a m above its mouth. Alaqua Bayou is about 1¼ miles in length, having a width of from one-half to more than 1 mile. This bayou is deep except at the mouth, where a bar has formed. The creek is narrow and sluggish, and is used exclusively above the town of Portland, Fla., for logging purposes. Portland, a sawmill settlement, and the site of a sawmill which cuts, for about nine months in the year, from 12,000 to 15,000 feet, B. M., per day, is situated on Alaqua Creek, about 1 mile above the head of Alaqua Bayou. From Portland down the creek is used only for the transportation of this mill's product, which is carried in small schooners, from 20 to 30 tons burden. to Pensacola, Fla. Three-fourths of a mile from the mouth of Alaqua Bayou is the mill of L. H. Berry & Co. This is quite an extensive plant and cuts about 8,000,000 feet, B. M., per annum. The output of this mill also finds a market in Pensacola, Fla., to which it is carried in small schooners and large barges, the latter towed by tugs sent over from Pensacola.

Just at the mouth of this bayou a bar has formed on which during ordinary tides there is 4½ feet of water. During the winter tides, which are frequently lower than summer tides, the depth is often reduced to 3½ feet.

The barges which transport nearly all of this mill output are owned by parties in Pensacola, and are capable of loading down to 5 feet draft. Therefore, they are compelled to make the trip to Pensacola, a distance of about 60 miles, with partial loads, or wait for more favorable tides. No agricultural products whatever are shipped from this section. The incoming commerce is simply store supplies brought chiefly on the schooners returning for lumber, and is not sufficient to cause any delay at the bar.

In addition to the present plant, Berry & Co. are building an extensive dry-house. This class of lumber will also be carried on barges to Pensacola.

The bar at the mouth of Alaqua Bayou is composed of soft mud mixed with sand. I had no difficulty in forcing a rod of iron from 5 to 6 feet into the bar. The mouth of this bayou is exposed to westerly winds across Choctawhatchee Bay, the fetch being about 8 miles. The depth of water on this bar, I was informed, has not been perceptibly changed by those winds.

A dredged channel through a bar of this nature would have to be made wide to insure any lasting benefits, owing to the instability of the material, and here would have to be wide enough to admit of schooners beating out. * * *

The completion of such a channel would doubtless greatly facilitate the operations of the mill of Berry & Co., but it can not be said that there would be any increase in the product or shipment of lumber should the work be performed, neither does it appear that the work would have a public character, or that the interests of the United States or general commerce would be subserved by its completion. Therefore, in my opinion, the improvement of this bar should not be undertaken by the General Government.

Very respectfully submitted.

J. E. TURTLE,
Assistant Engineer

Capt. PHILIP M. PRICE,
Corps of Engineers, U. S. A.

COMMERCIAL STATISTICS FOR ALAQUA BAYOU, FLORIDA.

Number of vessels*	536
Average tonnage	30
Value of outgoing cargoes	$165,000
Value of incoming tows and cargoes	102,000
	267,000

The above statement was submitted by L. H. Berry & Co.

In the "Incoming tows and cargoes," amounting to $102,000, are included the logs consumed by this mill, as they come from the Choctawhatchee and thence to the Alaqua Bayou, but are not detained at the bar owing to shallow water.

Respectfully,

J. E. TURTLE.

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* Each trip of each vessel is counted a vessel, not actually 536 vessels. In addition to this there are two small tugboats employed towing logs. A trip meaning from here to Pensacola and back here.

P 15.

PRELIMINARY EXAMINATION OF BAR AT THE JUNCTION OF CHOCTA HATCHEE BAY AND SANTA ROSA SOUND, FLORIDA.

UNITED STATES ENGINEER OFFICE,
Montgomery, Ala., April 21, 1893.

GENERAL: In accordance with the provisions of the river and ha bor act of July 13, 1892, and of the letter from your office of July 1 1892, I have the honor to submit the following report of the prelin inary examination "of the bar at the junction of Choctawhatchee Ba and Santa Rosa Sound, Florida."

The examination was made in April, 1893, by Assistant Engineer E. Turtle, a copy of whose report is forwarded herewith.

Santa Rosa Sound is a narrow body of water, about 14 miles lon between Santa Rosa Island and the mainland, connecting Pensaco Bay with Choctawhatchee Bay.

The country surrounding Choctawhatchee Bay and its affluents densely forested with fine timber, which is now being cut and sawe in the local mills. The lumber is nearly all towed in barges or raf by tugs, drawing 4 to 5 feet, to Pensacola Harbor, whence it is shippe mainly by water to all parts of the world. All supplies for the mil and settlements on Choctawhatchee Bay are transported from Pens cola through Santa Rosa Sound. The value of the commerce throug the sound is estimated at $800,000 per annum.

The depth of water in Santa Rosa Sound is nowhere less than 6 fe at mean low water, except near its junction with Choctawhatchee Ba where the depth of water decreases to 4 feet at two points, viz, at th Hurricane Crossing, in the "Narrows," and at the bar at the extrem eastern end of the sound.

* * * * * * *

I do not consider that any further survey is necessary.

I concur in the opinion of Assistant Engineer J. E. Turtle that th locality is worthy of improvement as proposed.

Very respectfully, your obedient servant,

PHILIP M. PRICE,
Captain, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. C. B. Comstock, Corps of Engineers, Division Engineer, Southwest Division.)

[First indorsement.]

U. S. ENGINEER OFFICE,
SOUTHWEST DIVISION,
New York, April 25, 1893.

Respectfully forwarded to the Chief of Engineers.

I concur in the opinion of the district engineer that this locality i worthy of improvement by the General Government.

C. B. COMSTOCK,
Colonel of Engineers,
Bvt. Brig. Gen., U. S. A., Division Engineer.

REPORT OF MR. J. E. TURTLE, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Fort Barrancas, Fla., April 17, 1893.

CAPTAIN: Pursuant to instructions of July 16, 1892, I have made an examination of the bar at the junction of Choctawhatchee Bay and Santa Rosa Sound, provided for by the river and harbor act of July 13, 1892, and respectfully submit the following report thereon.

This bar is situated on the west side of Choctawhatchee Bay, and where it unites with Santa Rosa Sound, it is formed of compact sand with occasional oyster shells. The present channel, which is also the deepest and shortest course across the bar, is straight and bears due east from Santa Rosa Sound. This channel has a depth at mean low water of 4 feet, and no doubt, during much time in winter, when northerly winds prevail, a depth of several inches less than this. The channel over this bar is exposed to easterly and northeasterly winds, having a fetch of about 10 and 40 miles, respectively. The water in Choctawhatchee Bay and to the eastward of this bar is deep; therefore, during ordinary winds, there is considerable seaway in the channel; in fact, it may be said that this bar is in an exposed locality. The currents are feeble, and no doubt irregular, and can exert no influence, either in deepening or shoaling this bar. Its formation, I think, is due to action of storms, but as far as I could learn, has been permanent for a period of many years.

Santa Rosa Sound, a narrow body of water about 36 miles in length, connects Pensacola and Choctawhatchee bays. On the east side of Choctawhatchee Bay, very large lumbering industries are carried on. All of this lumber forms a part of Pensacola's export trade, and is brought in schooners and on barges, towed by tugs, especially designed for this trade, across Choctawhatchee Bay, thence through Santa Rosa Sound and up Pensacola Bay to the shipping at Pensacola. In addition to lumber, considerable cattle, wool, wood, sheep, and cotton is brought from the lower Choctawhatchee River and Bay districts to Pensacola; while Pensacola is the distributing point of supplies for the La Grange Bayou, Lower Choctawhatchee River and all districts bordering on, and adjacent to, the waters of Choctawhatchee Bay. The commerce passing through Santa Rosa Sound and across this bar is estimated at $800,000 per annum, which I consider a fair one. While I was making this examination (one and one-half days), eleven schooners, six of them loaded, and one tow of two large barges, passed over this bar. These schooners are from 30 to 40 tons burden. During the winter months they are compelled, in order to avoid delays, to carry partial loads, while during moderately rough weather they dare not cross at all. It is a very common thing to see vessels aground on this bar; a few hours before I reached it, one succeeded in getting off, after being aground ten hours.

In view of these facts, I am of the opinion that the improvement of this bar would be of public service, and should be undertaken by the General Government.

* * * * * * *

The distance between the 6-foot curves in the direction of the channel across this bar was found to be 3,512 feet, and between the 4-foot curves 1,415 feet. The least depth found was 4 feet at mean low water. This channel, to afford rapid and safe passage to the commerce above named, should be 6 feet at mean low water and have a width of 150 feet. The only means of improving this bar is by dredging. * * *

From all I could learn regarding this bar, a channel once dredged would be very permanent.

It may be proper to report, that at the head of the "Narrows" (west end) in Santa Rosa Sound, there is one shoal crossing on which I found no more water than upon this bar in Choctawhatchee Bay. This shoal is known as the "Hurricane Crossing," the difference being that Hurricane is in a sheltered location, and that vessels are not endangered by grounding; they are simply detained, but to give relief to this commerce, Hurricane should also be improved by dredging. A channel of 100 feet in width and 5 feet at mean low water would answer here. * * *.

In connection with the improvement of the bar at the junction of Choctawhatchee Bay and Santa Rosa Sound, I would recommend the improvement of Hurricane Crossing in the Narrows of Santa Rosa Sound.

Very respectfully submitted.

J. E. TURTLE,
Assistant Engineer.

Capt. PHILIP M. PRICE,
Corps of Engineers, U. S. A.

APPENDIX Q.

IMPROVEMENT OF RIVERS AND HARBORS IN WESTERN ALABAMA AND EASTERN MISSISSIPPI, AND OF BOGUE CHITTO, LOUISIANA.

REPORT OF MAJ. A. N. DAMRELL, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1893, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Mobile Harbor, Alabama.
2. Black Warrior River, Alabama, from Tuscaloosa to Daniels Creek.
3. Warrior and Tombigbee rivers, Alabama and Mississippi.
4. Noxubee River, Mississippi.
5. Pascagoula River, Mississippi.
6. Chickasahay River, Mississippi.
7. Bluff Creek, Mississippi.
8. Leaf River, Mississippi.
9. Harbor at Biloxi, Miss.
10. Pearl River, below Jackson, Miss.
11. Pearl River, between Carthage and Jackson, Miss.
12. Pearl River, between Edinburg and Carthage, Miss.
13. Bogue Chitto, Louisiana.
14. Removing sunken vessels or craft obstructing or endangering navigation.

EXAMINATIONS.

15. Mississippi Sound.
16. Back Bay, Biloxi, Miss.
17. Mouth of Old Fort Bayou, Mississippi.
18. Mouth of Wolf River, Mississippi.
19. Mouth of Jordan River, Mississippi.
20. Pearl River, from Edinburg to Lake Burnside, Mississippi.
21. Diversion of Pearl River, near Jackson, Miss., through Tan Yard Branch.

UNITED STATES ENGINEER OFFICE,
Mobile, Ala., July 21, 1893.

GENERAL: I have the honor to forward herewith annual reports * * * for the fiscal year ending June 30, 1893, for the following works in my charge.

* * * * * * *

Very respectfully, your obedient servant,

A. N. DAMRELL,
Major of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

Q 1.

IMPROVEMENT OF HARBOR AT MOBILE, ALA.

The improvement of the channel of the harbor at Mobile, Ala., was begun by the General Government in 1827, the depth of water then being 5½ feet through Choctaw Pass and 8 feet on Dog River Bar. The following appropriations were made by act of Congress:

May 20, 1826	$10,000.00
March 2, 1829	20,000.00
June 24, 1834	10,000.00
March 3, 1835	17,997.60
March 3, 1837	50,000.00
July 7, 1838	50,000.00
August 3, 1852	50,000.00
	207,997.60
By act of Congress, March 3, 1857 (relief claim)	20,833.08
Total	228,830.68

The result obtained was a channel 10 feet deep and 200 feet wide through the pass and the same depth with an unknown width over the bar. In 1860 the channel through the pass was found to have shoaled to 7½ feet, the depth of water on the bar remaining the same.

No further improvement was attempted until 1870.

From 1870 to 1875 the following amounts were appropriated for the purpose of obtaining a depth of 13 feet:

By act of Congress—	
July 11, 1870	$50,000
March 3, 1871	50,000
June 10, 1872	75,000
March 3, 1873	100,000
June 23, 1874	100,000
March 3, 1875	26,000
Total	401,000

This amount was expended in dredging a channel 13 feet deep and 300 feet wide from the mouth of the Mobile River through Choctaw Pass, and 13 feet deep and 200 feet wide through Dog River Bar to the 13-foot curve in the bay. The work was completed in 1876, and the channel remained practically as it was dredged until operations were commenced under the new project to obtain a depth of 17 feet.

In 1878 a survey was directed to be made in order to determine whether the existing channel could be improved to a depth of 22 feet, and for this purpose Congress, by act of June 18, 1878, appropriated the sum of $10,000. The survey was made and a report was submitted to the Chief of Engineers, suggesting several plans of improvement. In March, 1880, it was decided to continue the former improvement by dredging to a depth of 17 feet, with a uniform width of 200 feet, from the 17-foot curve in the Mobile River to the curve of the same depth in the lower bay, the estimated cost being $820,000. From 1878 to June 30, 1887, the following amounts were appropriated:

By act of Congress—	
June 18, 1878 (survey)	$10,000
March 3, 1879	100,000
June 14, 1880	125,000
March 3, 1881	100,000
August 2, 1882	125,000
July 5, 1884	200,000
August 6, 1886	90,000
Total	750,000

Statement of work done under the above appropriations.

Date of act.	Name of contractor.	Contract price, measured in scow.	Cubic yards removed.	Commenced.	Completed.
		Cents.			
Mar. 13, 1879 June 14, 1880	George C. Fobes & Co	12.3	1,610,804	Feb. 19, 1881	Nov. 9, 1882
Mar. 3, 1881	G. L. Long	11.7	724,780	Mar. 21, 1882	Jan. 24, 1884
Aug. 2, 1882	R. Moore	12.3	888,093	Jan. 24, 1883	Feb. 9, 1884
July 5, 1884	Tobias Burke	9	1,920,438	Sept. 19, 1884	June 15, 1886
Aug. 6, 1886	R. Moore	9.5	829,854	Oct. 2, 1886	Apr. 25, 1887
	Total	....	5,973,919		

The channel of 17-foot depth was opened to a width of 75 feet in 1882, and was widened to 180 feet in 1889 and practically completed. During this time vessels passed through with a maximum draft of 18 feet, but owing to a filling in the cut at the lower end the draft was generally limited to 16 feet.

February 6, 1885, a project was submitted for the improvement of Mobile River and Harbor with a view of securing 23 feet depth of water, by enlarging and deepening by dredging the channel, which since 1870 had been deepened in that manner, first from 9 to 13 feet and then from 13 to 17. The estimated cost of the 23-foot project, with extension made by act of September 19, 1890, is $2,043,800, made up as follows:

Completion of 17-foot channel (including removal of material filled in cut upon which estimate for 23-foot cut was based)	$282,000
Dredging channel 280 feet wide on top of cut and central depth of 23 feet	1,500,000
Removing material that will fill in during progress of work on 23-foot channel (during three years)	198,000
Dredging channel in Mobile River up to Chichasabogue, 280 feet wide and 23 feet deep	63,800
Total	2,043,800

To which must be added $60,000 per year after June 30, 1891, for removing material that will fill in during the progress of the work.

From August 11, 1888, to the end of this fiscal year the following appropriations have been made:

By act of Congress—	
August 11, 1888	$250,000
September 19, 1890	350,000
July 13, 1892	212,500
Sundry civil act, March 3, 1893	500,000
Total	1,312,500

Statement of work done under above appropriations.

Date of act.	Name of contractor.	Contract price, measured in scow.	Cubic yards removed.	Commenced.	Completed.
		Cents.			
Aug. 11, 1888	Alabama Dredging and Jetty Co	9	2,312,295	Oct. 15, 1888	Feb. 17, 1890
Sept. 19, 1890	National Dredging Co	8⅜	3,060,619	Jan. 1, 1891	May 2, 1892
Do	Alabama Dredging and Jetty Co	15	422,691	July 1, 1891	Aug. 12, 1892
July 13, 1892	National Dredging Co	7 1/16	2,433,180	Nov. 7, 1892	....

Statement of work done under above appropriations—Continued.

Date of act.	Name of contractor.	Plant.		
		Apparatus.	Capacity of bucket.	Capacity of scows.
Aug. 11, 1888	Alabama Dredging and Jetty Co...	2 clam-shell dredges, 4 scows, and 2 tugs.	4 cubic yards each.	274, 441, 489, and 495 cubic yards
Sept. 19, 1890	National Dredging Co...............	3 clam-shell dredges, 8 scows, 3 tugs.	3½, 4, and 4½ cubic yards each.	265, 296, 313, 319, 323, 495, 5 and 539 cubic yards.
Do.......	Alabama Dredging and Jetty Co...	1 clam-shell dredge, 2 scows, and 1 tug.	4 cubic yards .	318 and 489 cubic yards.
July 13, 1892	National Dredging Co...............	4 clam-shell dredges, 12 scows, 5 tugs.	2¾, 4, 4⅓, and 4½ cubic yards.	260, 296, 308, 31 318, 319, 3 495, 489, 53 , 532 and 634 cubic yards.

Advertisements inviting proposals for dredging in Mobile River were published and are to be opened July 11, 1893.

Tabular statement showing the channel as dredged and its condition June, 1893.

Locality.	Dredged 1881-1893.					Examinations.					
	From the initial point, mouth of Chickasabogue.	Length between stations or clusters.	Width.	Central depth.		Cross section at—	Top width.	Maximum depth in cross section.			
				Old tide gauge.	New tide gauge.			Old gauge.			New gauge.
								June, 1891.	June, 1892.	June, 1893.	June, 1893.
Mobile River, Alabama.	*Miles.*	*Feet.*	*Feet.*	*Feet.**	*Feet.†*		*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*
Initial point, mouth of Chickasabogue	0.00	000	....	....	....	Initial point, mouth of Chickasabogue.	1,275	17.6	17.6	18.0	16.3
Initial point at mouth of Chickasabogue to midway between initial point and Station 1.	0.75	4,010	....	....	....	Midway between initial point and Station 1.	750	23+	23+	25.3	23.6
Midway between initial point and Station 1, or mouth of Three Mile Creek.	1.50	4,010	....	....	....	Station 1	650	23+	23+	25.5	23.8
Station 1 to Station 2	1.61	500	80	23-24	....	Station 2	850	21.4	21.4	25.9	24.2
Station 2 to Station 3	2.03	2,220	80	23-24	....	Station 3	900	20.6	20.6	24.9	23.2
Station 3 to Station 4, or mouth of One Mile Creek.	2, 22	1,000	....	....	....	Station 4	1,350	23.0	23.0	23.3	21.6
Station 4 to north side Beauregard street	2.37	810	....	....	....	North side Beauregard street	980	23+	23+	22.6	20.9
North side Beauregard street to north side Congress street.	2.62	1,270	80	23-24	....	North side Congress street	925	23.0	23.0	26.5	24.3
North side Congress street to north side St. Louis street.	2.83	1,140	40	23-24	....	North side St. Louis street	910	19.8	19.4	23.8	22.1
North side St. Louis street to north side Dauphin street.	3.02	1,000	40	23-24	....	North side Dauphin street	950	18.4	18.4	24.8	22.6
North side Dauphin street to north side Government street.	3.16	780	90	23-24	....	North side Government street	1,100	19.6	19.6	26.1	24.4
North side Government street to south side Theater street.	3.38	1,190	40	23-24	....	South side Theater street	1,550	18.2	18.2	21.4	19.7
South side Theater street to north side Eslava street.	3.54	815	40	23-24	....	North side Eslava street	775+	18.8	18.8	23.5	21.8
North side Eslava street to north side Charleston street.	3.92	2,010	40	23-24	....	North side Charleston street	650	18.1	18.1	22.9	21.2
North side Charleston street to north side Elmira street.	4.21	1,560	40	23-24	....	North side Elmira street	570	21.4	21.4	24.1	22.4
North side Elmira street to Station 5	4.43	1,170	....	....	....	Station 5	650	23.0	23.0	29.7	28+
Station 5 to midway between north and south, 23-foot curves.	4.48	260	....	....	....	Midway between north and south 23-foot curves.	600+	23+	23+	27.8	26.1

*Soundings on the old tide gauge were referred to a bench mark which is the horizontal top of the west abutment of the steps of the custom-house, Mobile, Ala., said datum line being 11.81 feet above the zero of the gauge.

†Soundings on the new tide gauge are referred to the same bench mark, with the difference that the zero of the gauge has been lowered to 13.51 feet below said datum line to agree with the soundings of the U. S. Coast and Geodetic Survey.

Tabular statement showing the channel as dredged and its condition June, 1893—Continued.

Locality.	Dredged 1881-1893.					Examinations.					
	From the initial point, mouth of Chickasabogue.	Length between stations or clusters.	Width.	Central depth.		Cross section at—	Top width.	Maximum depth in cross section.			
				Old tide gauge.	New tide gauge.			Old gauge.			New gauge.
								June, 1891.	June, 1892.	June, 1893.	June 1893.
Mobile Bay, Alabama.	*Miles.*	*Feet.*	*Feet.*	*Feet.**	*Feet.*†		*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*
Midway between north and south 23-foot curves to initial point between Virginia and Texas streets.	4.53	260	....	....	....	Initial point between Virginia and Texas streets.	6,201	23.0	23.0	28.6	26.9
Initial point between Virginia and Texas streets to Station 6.	Choclaw Pass. 4.66	700	120	23-24	....	Station 6	700	20.6	20.6	24.9	23.0
Station 6 to Chain Cluster No. 1	4.89	1,170	145	23-24	....	Chain Cluster No. 1	530	21.4	26.2	25.5	23.8
Chain Cluster No. 1 to Chain Cluster No. 2	5.04	820	145	23-24	....	Chain Cluster No. 2	700	19.3	26.3	24.1	22.4
Chain Cluster No. 2 to Upper Gap Light Stake.	5.35	1,650	145	23-24	....	Upper Gap Light Stake	700	21.3	25.9	24.5	22.8
Upper Gap Light Stake to Cluster No. 2	5.54	978	245	23-24	....	Cluster No. 2	700	21.6	28.0	26.1	24.4
Cluster No. 2 to Chain Cluster No. 3	5.96	2,259	145	23-24	....	Chain Cluster No. 3	700	23.0	26.8	25.5	23.8
Chain Cluster No. 3 to Lower Gap Light Stake.	6.38	2,182	155	23-24	....	Lower Gap Light Stake	700+	20.0	28.0	29.7	28.×
Lower Gap Light Stake to Cluster No. 3	6.87	2,565	145	23-24	....	Cluster No. 3	700+	20.5	27.3	25.4	23.7
Cluster No. 3 to Cluster No. 4	7.36	2,603	200	23-24	....	Cluster No. 4	700+	26.2	26.0	24.3	22.6
Cluster No. 4 to Cluster No. 5	8.15	4,194	200	23-24	....	Cluster No. 5	700+	28.0	26.7	24.6	22.9
Cluster No. 5 to Cluster No. 6	8.41	1,338	200	23-24	....	Cluster No. 6	700+	26.5	26.7	24.2	22.5
Cluster No. 6 to Cluster No. 7	8.92	2,735	145	23-24	....	Cluster No. 7	700+	23.5	23.9	22.0	20.3
Cluster No. 7 to Cluster No. 8	9.50	2.998	145	23-24	....	Cluster No. 8	700+	26.7	25.2	22.9	21.2
Cluster No. 8 to Cluster No. 9	10.00	2,654	145	23-24	....	Cluster No. 9	700+	28.0	26.3	23.6	21.7
Cluster No. 9 to Cluster No. 10	10.51	2,713	145	23-24	....	Cluster No. 10	700+	18.6	25.5	23.2	21.5
Cluster No. 10 to Cluster No. 11	11.01	2,655	145	23-24	....	Cluster No. 11	700+	18.4	25.5	23.2	21.5
Cluster No. 11 to Cluster No. 12	11.49	2,610	145	23-24	....	Cluster No. 12	700+	17.8	25.5	23.3	21.6
Cluster No. 12 to Cluster No. 13	11.98	2,501	145	23-24	....	Cluster No. 13	700+	18.2	23.5	21.9	20.2
Cluster No. 13 to Cluster No. 14	12.44	2,418	145	23-24	....	Cluster No. 14	700+	18.1	25.8	22.8	20.6
Cluster No. 14 to Cluster No. 15	12.93	2.625	145	23-24	....	Cluster No. 15	700+	18.2	25.6	22.0	20.8
Cluster No. 15 to Cluster No. 16	13.44	2,666	145	23-24	23-24	Cluster No. 16	700+	17.9	26.5	21.4	19.7
Cluster No. 16 to Cluster No. 17	13.93	2,591	145	23-24	23-24	Cluster No. 17	700+	17.6	24.0	29.7	28+
Cluster No. 17 to Cluster No. 18	14.40	2,582	145	23-24	23-24	Cluster No. 18	700+	17.8	23.7	29.7	28+
Cluster No. 18 to Cluster No. 19	14.90	2,616	145	23-24	23-24	Cluster No. 19	700+	17.9	25.5	28.2	26.5
Cluster No. 19 to Cluster No. 20	15.42	2,659	145	23-24	23-24	Cluster No. 20	700+	18.0	23.5	27.7	26.0
Cluster No. 20 to Cluster No. 21	15.91	2,580	145	23-24	23-24	Cluster No. 21	700+	18.2	24.1	29.7	28+
Cluster No. 21 to Cluster No. 22	16.39	2,550	145	23-24	24-25	Cluster No. 22	700+	17.8	23.5	26.0	24.8
Cluster No. 22 to Cluster No. 23	16.90	2,590	145	23-24	24-25	Cluster No. 23	700+	17.8	23.0	28.4	26.7
Cluster No. 23 to Cluster No. 24	17.36	2,502	145	23-24	24-25	Cluster No. 24	700+	17.2	24.0	28.8	26.6
Cluster No. 24 to Cluster No. 25	17.84	2,560	145	23-24	24-25	Cluster No. 25	790+	17.4	23.5	28.1	26.4
Cluster No. 25 to Cluster No. 26	18.32	2,535	145	23-24	24-25	Cluster No. 26	700+	17.1	22.6	28.3	26.6

Cluster No. 26 to Cluster No. 27	18.81	2,592	145	23-24	24-25	Cluster No. 27	700+	17.2	21.8	29.7	28+
Cluster No. 27 to Cluster No. 28	19.30	2,592	145	23-24	24-25	Cluster No. 28	700+	17.0	21.3	29.7	28+
Cluster No. 28 to Cluster No. 29	19.79	2,587	145	23-24	24-25	Cluster No. 29	700+	17.1	22.6	29.7	28+
Cluster No. 29 to Cluster No. 30	20.29	2,620	145	23-24	24-25	Cluster No. 30	700+	16.7	23.0	26.4	24.7
Cluster No. 30 to Station 7	20.47	940	145	23-24	24-25	Station 7	700+	16.7	23.0	25.4	23.7
Station 7 to Cluster No. 31	20.62	840	145	23-24	24-25	Cluster No. 31 (or Middle Bay Light)	700+	16.7	23.0	23.7	22.0
Cluster No. 31 to Station 8	20.80	918	145	23-24	24-25	Station 8	700+	16.3	23.0	25.0	23.3
Station 8 to Cluster No. 32	21.11	1,655	145	23-24	25-26	Cluster No. 32	700+	16.8	23.0	24.3	22.6
Cluster No. 32 to Cluster No. 33	21.61	2,650	185	23-24	25-26	Cluster No. 33	700+	16.4	22.0	24.6	22.9
Cluster No. 33 to Cluster No. 34	22.14	2,750	185	23-24	25-26	Cluster No. 34	700+	16.0	22.6	23.0	21.3
Cluster No. 34 to Cluster No. 35	22.65	2,725	185	23-24	25-26	Cluster No. 35	700+	20.1	21.9	22.8	21.1
Cluster No. 35 to Cluster No. 36	23.17	2,750	185	23-24	25-26	Cluster No. 36	700+	23.7	21.2	22.7	21.0
Cluster No. 6 to Cluster No. 37	23.67	2,615	185	23-24	25-26	Cluster No. 37	700+	24.5	21.7	23.4	21.7
Cluster No. 37 to Cluster No. 38	24.15	2.540	185	23-24	25-26	Cluster No. 38	700+	23.2	23.7	26.2	24.5
Cluster No. 38 to Cluster No. 39	24.66	2,695	185	33-24	25-26	Cluster No. 39	700+	23.3	24.6	24.7	23.0
Cluster No. 39 to Cluster No. 40	25.17	2,705	185	23-24	25-26	Cluster No. 40	700+	23.2	24.8	24.7	23.0
Cluster No. 40 to Cluster No. 41	25.59	2,227	185	23-24	25-26	Cluster No. 41	700+	20.7	22.6	25.9	24.2
Cluster No. 41 to Cluster No. 42	26.19	3,160	185	23-24	25-26	Cluster No. 42	700+	19.7	23+	26.3	24.6
Cluster No. 42 to Cluster No. 43	26.73	2,824	135	23-24	25-26	Cluster No. 43	700+	14.7	24.8	21.8	20.1
Cluster No. 43 to Cluster No. 44	27.23	2,660	135	23-24	25-26	Cluster No. 44	700+	14.9	20.6	21.3	19.6
Cluster No. 44 to Cluster No. 45	27.80	3,230	185	23-24	25-26	Cluster No. 45	700+	15.4	21.9	21.7	20.0
Cluster No. 45 to Cluster No. 46	28.25	2,145	185	23-24	25-26	Cluster No. 46	700+	15.4	21.7	22.5	20.8
Cluster No. 46 to Cluster No. 47	28.79	2,865	185	23-24	25-26	Cluster No. 47	700+	16.1	20.2	24.2	22.5
Cluster No. 47 to Cluster No. 48	29.30	2,701	185	23-24	24-25	Cluster No. 48	700+	16.1	22.4	29.7	28+
Cluster No. 48 to Cluster No. 49	29.84	2,333	185	23-24	24-25	Cluster No. 49	700+	17.0	24.2	29.7	28+
Cluster No. 49 to Cluster No. 50	30.39	2,930	185	23-24	24-25	Cluster No. 50	700+	17.7	25.7	29.7	28+
Cluster No. 50 to Cluster No. 51	30.81	2,210	185	23-24	24-25	Cluster No. 51	700+	17.8	25.5	29.7	28.0
Cluster No. 51 to Station 9	31.04	1,200	80	23-24	24-25	Station 9	700+	17.9	25.7	29.7	28+
Station 9 to Station 10	31.49	2,400	40	....	24-25	Station 10	700+	....	....	29.7	28+
Station 10 to Station 11	31.95	2,400	40	....	24-25	Station 11	700+	....	....	29.7	28+
Station 11 to Station 12	32.45	2,400	80	....	24-25	Station 12	700	....	....	29.7	28+
Station 12 to Station 13	32.86	2,400	80	....	24.25	Station 13	700+	....	....	28.2	26.5
Station 13 to Station 14	33.09	1,200	....	....	....	Station 14	....	....	....	24.8	23.1

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* Soundings on the old tide gauge were referred to a bench mark which is the horizontal top of the west abutment of the steps of the custom-house, Mobile Ala., said datum line being 11.81 feet above the zero of the gauge.

† Soundings on the new tide gauge are referred to the same bench mark, with the difference that the zero of the gauge has been lowered to 13.51 feet below said datum line to agree with the soundings of the U. S. Coast and Geodetic Survey.

Money statement.

July 1, 1892, balance unexpended		$18, 121. 45
Amount appropriated by act approved July 13, 1892		212, 500. 00
Amount appropriated by sundry civil act approved March 3, 1893		500, 000. 00
		730, 621. 45
June 30, 1893, amount expended during fiscal year		178, 319. 38
July 1, 1893, balance unexpended		552, 302. 07
July 1, 1893, outstanding liabilities	$42, 414. 02	
July 1, 1893, amount covered by uncompleted contracts	456, 000. 00	
		498, 414. 02
July 1, 1893, balance available		53, 888. 05
Amount (estimated) required for completion of existing project		731, 300. 00
Amount (estimated) required for preservation of improvement		180, 000. 00
Amount that can be profitably expended in fiscal year ending June 30, 1895		750, 000. 00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

COMMERCIAL STATISTICS.

Description.	Entries.						Clearances.					
	1893.			1892.			1893.			1892.		
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.
Foreign	234	150, 231	3, 150	156	108, 190	2, 107	229	152, 626	3, 373	164	121, 229	2, 309
Coastwise	125	90, 363	2, 501	151	100, 235	2, 789	131	94, 143	2, 594	134	82, 300	2, 322
American	104	36, 567	824	68	23, 890	503	119	47, 151	1, 018	80	28, 321	595
Total	463	277, 161	6, 475	375	232, 315	5, 399	479	293, 920	6, 985	378	231, 850	5, 226

Imports and exports.

Description.	1893.	1892.
Duties on imports	$15, 108. 88	$7, 949. 72
Tonnage dues	8, 610. 02	6, 429. 42
Hospital collections		328. 00
Care and treatment of foreign sailors and overtime of officers	430. 00	
Official fees	2, 052. 53	
Fines, penalties, and miscellaneous	230. 60	1, 418. 39
Total collections	26, 432. 03	16, 125. 53
Exports	3, 319, 381. 10	2, 790, 014. 00

Comparative statement of timber, lumber, etc., shipped to foreign and coastwise ports.

Description.	1893.	1892.	1891.	1881.
Lumber:	*Tons.*	*Tons.*	*Tons.*	*Tons.*
Foreign	80, 148	51, 217	40, 054	15, 375
Coastwise	27, 776	24, 838	31, 123	12, 783
Total	107, 924	76, 055	71, 177	28, 158
Timber, foreign	94, 090	73, 527	62, 292	27, 101
Cross-ties, piles, and poles, foreign	8, 876	4, 551		
Shingles, coastwise	936	1, 350	19	480
Staves, foreign	332	189	111	831

Comparative statement of number and draft of vessels passing up and down the dredged channel during the fiscal years ending June 30, 1892 and 1893.

Draft in feet.	Steamships.				Ships and barks.				Brigs.				Schooners.				Total.			
	Up.		Down.		Up.		Down.		Up.		Down.		Up.		Down.		Up.		Down.	
	1893.	1892.	1893.	1892.	1893.	1892.	1893.	1892.	1893.	1892.	1893.	1892.	1893.	1892.	1893.	1892.	1893.	1892.	1893.	1892.
Under 13	103	....	19	....	102	....	1	....	18	....	5	....	187	....	104	....	410	....	129	....
13 to 14	10	54	6	4	20	53	5	4	....	....	2	5	3	....	28	15	33	107	41	28
14 to 15	2	3	57	51	5	12	4	3	....	....	7	2	....	5	27	34	7	20	95	90
15 to 16	2	4	20	4	4	2	9	6	1	....	....	....	3	....	14	22	10	6	43	32
16 to 17	1	1	2	2	....	1	16	54	1	1	....	1	....	....	5	6	2	3	23	63
17 to 17½	....	....	1	4	....	1	6	11	....	....	....	....	....	....	2	2	....	1	9	17
17½ to 18	....	....	1	2	....	....	34	14	....	....	....	....	1	....	....	....	1	....	35	16
18 to 19	....	....	5	1	....	....	27	6	....	....	....	....	....	....	1	....	....	....	33	7
19 to 20	....	....	....	....	....	....	22	....	....	....	....	....	....	....	....	....	....	....	22	....
20 and over	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	2	....
Total	118	62	111	68	131	69	126	98	20	1	14	8	194	5	181	79	463	137	432	258

NOTE.—In the report of vessels passing up and down the dredged channel for the fiscal year ending June 30, 1892, the number drawing less than 13 feet was not included in the tabular statement.

Q 2.

IMPROVEMENT OF BLACK WARRIOR RIVER, ALABAMA, FROM TUSCALOOSA TO DANIELS CREEK.

Act of May 23, 1828, declared Black Warrior River, Alabama, free from all tolls except such as might be allowed by act of Congress (Sec. 5244, Rev. Stat., edition of 1878, p. 1015).

An examination and partial survey of the river from Locust Fork to Tuscaloosa, 47½ miles, was made in 1874, in accordance with provisions of act of Congress approved June 23, 1874, report of which is contained in report of Chief of Engineers, 1875.

A survey of the river from Tuscaloosa to forks of Sipsey and Mulberry, 92½ miles, was made in the fall of 1879, as directed by act of Congress approved March 3, 1879.

The report thereon is contained in report of Chief of Engineers, 1881, Part II, p. 1218.

Appropriations have been made as follows:

By act of—	
July 5, 1884	$50,000
August 5, 1886	56,250
August 11, 1888	100,000
September 19, 1890	150,000
July 13, 1892	200,000
Total	556,250

Under the first appropriation a survey for locating works of improvement and for obtaining data upon which to base detailed plans and estimates was commenced in September, 1884, and a report proposing a system of improvement by locks and movable dams was submitted December 19, 1885.

A Board of Engineers for considering the report and project met in Tuscaloosa, February 10, 1886, and recommended a change to locks and fixed dams of increased lift.

Plans and estimates prepared in accordance with the recommendation were submitted August 13, 1886, and, with slight modifications, were accepted by the Board in their report of April 2,1887. The project was approved May 19, 1887. The extent of the work is the construction of five locks and dams, with a total lift of 52 feet, between Tuscaloosa and Daniels Creek, 14¾ miles, and its purpose is to furnish slack-water navigation for barges of 6 feet draft.

The locks are to be 52 feet clear width, 322 feet long between hollow quoins, available length 285 feet, and to have a depth of 6½ feet on miter sills, and are to have iron gates. The dams are to be of rock-fill type. The estimated cost was $741,670, which will be probably exceeded, as the rock used in construction is found, both in quarrying and working, more expensive than was anticipated.

Work was commenced in March, 1888, and has been carried on continually since, with the exception of a suspension from Septemper 1 to October 20, 1890, caused by exhaustion of funds.

Work done during the fiscal year ending June 30, 1892, was as follows:

Lock No. 1:		
Rock used in bank revetment and dam	cubic yards..	9[illegible]
Additional paving	do....	44[illegible]
Lock No. 2:		
Rock excavated in foundation	do....	891
Earth excavated in foundation	do....	1,9[illegible]
Ashlar quarried	do....	2,7[illegible]
Backing quarried	do....	6[illegible]
Masonry laid	do....	6,12[illegible]
Stone cut	do....	2,[illegible]
Lock No. 3—		
Ashlar quarried	yards..	35[illegible]
Backing quarried	do....	3[illegible]
Stone cut	do....	57

The condition of the work June 30, 1892, was as follows:

Lock No. 1—Complete as to masonry, with south bank sloped, paved, and turfed Lock-tender's house built. Dam filled to 9 feet below crest.

Lock No. 2—North wall of lock built and one-third of bank wall.

Lock No. 3—Cofferdam built and 356 yards of ashlar quarried.

The work during the fiscal year ending June 30, 1893, is, with the analysis of cost, as follows:

	Lock No. 1.	Lock No. 2.	Lock No. 3.	Total.	Remarks and quantities.
Engineering and office expenses	$363.20	$1,236.50	$4,835.55	$6,435.25	
Track and roads repair and changes.	39.80	3.80	1,535.08	1,578.68	Includes removal bridges.
Cofferdams and pumping	....	109.54	....	109.54	
Rock excavation	....	....	2,760.27	2,760.27	2,500 yards excavated.
Handling and hauling stone and sand.	*435.87	1,178.19	5,389.26	7,003.32	3,500 yards sand. 9,500 yards stone.
Gates and valves	224.94	116.24	1.62	342.80	Material delivered.
Buildings and boat repairs	....	737.97	79.95	817.92	Rebuilding derrick •. B. m'y.
Masonry	*1,055.18	6,833.45	2,733.04	10,621.67	5,602 yards laid.
Tools and plant maintenance and additions.	18.00	1,009.10	11,295.91	12,323.01	Includes machinery and blacksmithing.
Stone cutting	....	312.55	15,233.58	15,546.13	2,661 yards cut.
Quarry	....	....	10,128.39	10,128.39	735 yards backing. 1,[illegible] yards ashlar.
Earth excavation	*866.94	505.89	373.08	1,745.91	8,854 cubic yards.
Earth fill	....	1,351.86	....	1,351.86	5,743 cubic yards.
Turfing and paving	*347.20	676.13	1,023.33	2,046.66	4,064 square yards pav[illegible] 1,021 square yards turf[illegible]
Dams	536.80	....	194.00	730.80	Material delivered.
Incidentals	995.64	671.25	2,942.91	4,609.80	Mainly expenses caused by flood.
Total	4,883.57	14,742.47	58,525.97	78,152.01	

* For abutment, the stone for which was previously prepared.

From the foregoing table it will be seen that engineering and office expenses amounted to 8¼ per cent of total amount expended. The cost per unit for work for different items was as follows:

Stone cutting	per yard..	$5.74
Laying masonry (excepting cement)	do....	1.20
Quarrying (neglecting backing)	do....	2.74
Earth excavation	do....	.19 7/10
Earth filling, including sloping	do....	.23¼
[1]Paving and turfing	per square yard..	.40
Rock excavation (1 foot to 3 feet deep)	per yard..	1.10
Handling and hauling	do....	.54

The cost as here shown is somewhat less than for previous years, although the work throughout the year was done under the eight-hour law.

It will be noticed that the amount charged to incidentals is a considerable item of expense. It is made up mainly of flood expenses. There were five floods during the working season, and the cost of taking out slides, removing and replacing plant, watching and caring for boats and other property, and especially cleaning up and reëstablishing a good working condition after subsidence of the waters, makes a flood during the working season a costly affair.

PRESENT CONDITION OF THE WORK.

Lock No. 1.—Masonry of lock and abutment completed. Lock-tender's house built and used as an office. Lock yard paved and both banks sloped and paved nearly. Timber and stone filling for dam on hand. Needle dam ready to put in.

Lock No. 2.—Lock masonry completed; south bank sloped, paved, and turfed; rock filling for dam on hand, 378 yards; grading done for abutment, 3,091 yards; lumber for needle dam on hand and partly framed; face stone and coping for abutment in readiness.

Lock No. 3.—Lock chamber excavated; masonry commenced; 2,579 yards of cut stone on hand; 1,750 yards of backing on hand; 932 yards of earth excavated for bank wall; 2,321 yards sand for mortar hauled.

During the year ending June 30, 1894, it is expected to finish the masonry for Lock 3, the abutments of Locks 2 and 3, and to put in the gates and valves of Lock 1. In the following year it is expected to have Locks 1, 2, and 3 with their dams completed ready for use. This will open up ten miles of river and render accessible a large area of 3 and 4 feet coal seams.

In the last report it was estimated that $200,000 would complete the three locks and dams in two years. Although the eight-hour law has since gone into effect, it is still estimated that with present prices for labor and material the above sum will complete the work in hand. But owing to time lost from floods, delays in securing titles to lock and abutment sites, and other causes, it is now evident one more year will be needed for completing this work.

Proposals for furnishing the iron and steel needed for the gates for Lock 1 were called for, to be opened June 10, 1893. Only one bid was received, which, being some 60 per cent over the estimated cost, was considered excessive and was rejected.

COMMERCIAL IMPORTANCE.

The completion of the project now in progress will extend the navigable waters of the Warrior River into the chief mineral region of Alabama (known as the Birmingham district), giving it a water outlet to the Gulf. The first result anticipated is the development of the coal seams adjacent to the river. Under the favorable conditions for mining that exist and the low cost of barge transportation it is estimated that the output of these mines can be profitably marketed in Mobile Bay at $1.25 per ton. At this price the Warrior Mines could practically monopolize the coal business of the Gulf, both for local consumption and for export, and the coal tonnage on the river would be so great, as of itself, to justify the cost of river improvement; but it seems quite probable that the coal business would not be the only or even the most important one to be developed by the improved river; that to be derived from other mineral resources must be considered.

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[1] Material for paving was supplied by the waste from the stone-yard.

The present annual output capacity of Jefferson County, in which Birmingham is situated, is estimated in round numbers as follows:

	Tons.
Coal (daily capacity 14,000 tons)	5,000,000
Coke	1,300,000
Iron ore	2,700,000
Pig iron (daily capacity 2,500 tons)	900,000

The works producing the above output can readily be connected with the Warrior by short extensions of existing railways, and the future iron and steel plants, with the river opened, would doubtless be placed on or adjacent to the river banks. At present the Birmingham furnaces have to market their products in the North and West, and the cost of transport over the long rail routes by which these markets are reached offsets to a great extent the exceptional advantages that these furnaces possess for cheap production. Moreover, the Birmingham products, by increasing so largely the stocks in the northern markets, have tended to reduce prices, and have doubtless intensified, if they have not caused, the depression that has prevailed in the iron industries during the past two years. Hence a water route, opening new markets to the Birmingham iron trade, would benefit not only that trade but the iron industries of the whole country.

Should the Nicaragua Canal be opened, the Birmingham furnaces, rolling-mills, and steel plants will find their best and most cheaply accessible markets along the Pacific Coast, via the Warrior River and the Nicaragua Canal. Naturally their products would move in that direction.

Money statement.

July 1, 1892, balance unexpended	$31,795.08
Amount appropriated by act approved July 13, 1892	200,000.00
	231,795.08
June 30, 1893, amount expended during fiscal year	79,979.97
July 1, 1893, balance unexpended	151,815.11
July 1, 1893, outstanding liabilities	5,190.56
July 1, 1893, balance available	146,624.55
Amount (estimated) required for completion of existing project	185,420.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	185,420.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

Q 3.

IMPROVEMENT OF WARRIOR AND TOMBIGBEE RIVERS, ALABAMA AND MISSISSIPPI.

WARRIOR RIVER.

The examination and partial survey of the river from Tuscaloosa to Demopolis was made in 1874, and report thereon may be found in the Report of the Chief of Engineers of 1875, Part II, p. 16. In its original condition the river was well adapted for high-water navigation, having a width of 400 feet at Tuscaloosa, gradually diminishing to 150 feet near its mouth. The boating stage usually lasted five months, from December 1 to May 1, the depth ranging from 10 to 40 feet, and the only obstructions encountered were overhanging trees, which sometimes carried away chimneys of steamboats and damaged their upper works. Below a 10-foot stage, snags became troublesome, and below 5 feet navigation practically ceased.

The obstructions to low-water navigation were: (1) Ninety-four bars and reefs that afforded a ruling depth of 12 to 30 inches; (2) numerous snags and sunken logs, choking up the bar chutes and frequent in the reaches also; (3) overhanging trees that effectually closed narrow chutes, even if otherwise open.

The improvement of the Warrior was authorized by act of Congress of March 3, 1875, and the project adopted was to deepen the bars by jetty construction, remove snags, and cut down overhanging trees, with a view to obtaining for small boats a low-water channel 80 feet wide by 4 in depth.

The estimated cost of the improvement was $105,103. Appropriations were made as follows:

Warrior and Tombigbee rivers:	
March 3, 1875	$25,000
August 14, 1876	15,000
June 18, 1878	28,000
March 3, 1879	20,000
Warrior River:	
June 14, 1880	20,000
March 3, 1881	10,622
August 2, 1882	10,000
July 5, 1884	12,000
August 5, 1886	18,750
August 11, 1888	18,000
September 19, 1890	45,000
July 13, 1892	75,000
Total	297,372

Of this amount, $134,372 was appropriated for the Warrior, and $88,000 for Warrior and Tombigbee jointly.

The execution of the project was commenced in June, 1875, and continued for an average annual period of four months up to November 10, 1885, and for three months in 1887, the work being confined chiefly to the removal of snags and overhanging trees. Channel deepening by jetty construction was also attempted upon 49 of the bars affording the shoalest water.

The work in 1887 was done by contract. The work of removing snags and logs has been repeated several times over a great part of the river. This has been made necessary from the fact that landslides and caving banks every year throw many trees into the river that, anchored by their roots, obstruct the channel. This trouble will continue until stability shall have been given to the yielding banks. The work of sloping and revetting needed for this purpose was not originally contemplated, but as the necessity for it became apparent an experimental section 3,000 feet long was tried in 1886, costing at the rate of $6,000 per mile, which proved satisfactory. The practical results accomplished under the above project may be stated as having lowered the navigable stage 3 feet, a boat with 600 bales of cotton and drawing 4½ feet passing down the river without difficulty on a stage barely 2 feet above low water.

Better results than this could not be expected in continuing the old project because the slope on portions of the river is such that the low-water discharge will not give a uniform depth of more than 2½ feet in a channel 80 feet wide. Moreover, the statement as to the results obtained holds good only in the fall, because the low-water chutes around the bars lie out of the current during high water, and consequently fill up. The scouring-out process does not keep pace with the fall of the river surface in the spring, and it is not until late in the summer that the chute become fully opened.

It was therefore evident that to secure a 4-foot low-water channel of navigable width a new project had to be adopted and when the improvement of the Black Warrior River above Tuscaloosa was undertaken for the benefit of the recently developed mineral business of the Upper Warrior it was evident that the 6-foot low-water depth adopted in that project should be extended throughout the river below.

A survey of the Warrior was authorized from Tuscaloosa to the mouth in order to get the data necessary for preparing plans and estimates for the improvements of the river on scale desired. The survey was commenced in the summer of 1887 and completed in the fall of 1889, and a report was submitted December 24, 1889, proposing a plan of improvement to obtain a good channel with a minimum depth of 6 feet at low water by a system of dams and pneumatic gates in connection with snagging, cutting of overhanging trees, bank revetment, and bar improvement, at an estimated cost of $577,000.

Since that time a more careful study of the data obtained by the survey has resulted in a change in the views previously entertained, and a belief that locks in similar sizes and general construction to those above Tuscaloosa will be better than the pneumatic gates. The work during the fiscal year ending June 30, 1891, was confined to a preparation of a portion of a suitable plant for future use in the improvement of the river, the old plant having been completely used up, and an attempt to do the work by contract having resulted in the conviction that it was more economical and advantageous to do the work by day's labor.

During the fiscal year ending June 30, 1892, work on the improvement of this river was commenced at Forrest Bridge Piers on December 1, 1891, and carried down to the mouth, suspended December 23, 1891, on account of high water, resumed early in March, 1892, at Choctaw Bluff, Ala., suspended during the latter part of March, 1892, on account of high water, and resumed in May, 1892.

The following is a statement of work performed during fiscal year ending June 30, 1893:

Work was commenced by the hand-power snag boat *Vienna* at Cowens Bluff, and by the steam-capstan boat *Demopolis* at Lassiters Shoals, July 1, 1892.

The snag boat *Vienna* was towed up to Stephens Bluff on the 19th, and the snag boat *Demopolis* up to Erie Island on the 21st of August, 1893, and commenced working downstream.

In December, 1892, the snag boat *Demopolis* returned upstream.

Work was suspended December 19, 1892, on account of high water, and the snag boat *Demopolis* was carried up to Forrest Piers, and the snag boat *Vienna* down to the mouth and laid up.

Work was resumed January 18, 1893, by the snag boat *Demopolis* from Forrest Piers, down, and by the snag boat *Vienna* from the mouth up. Work was again suspended on February 16, 1893, on account of high water, and the plants were towed up to Tuscaloosa, Ala., and laid up.

Work was resumed in May, 1893, at Tuscaloosa removing snags and building dams and continued up to June 30, 1893. The snag boat *Demopolis* improved 114½ miles of river downstream, and 35¾ miles upstream. The snag boat *Vienna* improved 50¼ miles of river downstream, and 14 miles upstream.

The following obstructions were removed during the fiscal year ending June 30, 1893:

Snags pulled and removed	1,666
Sunken logs and trees pulled and removed	132
Stumps cut, leveled, blasted, and removed	107
Logs on bank cut up	66
Slip-ins pulled, trimmed, and removed	800
Trees in slip-ins removed	205
Overhanging trees felled, pulled back, and cut up	3,986
Trees trimmed	44
Trees deadened	1,165
Drift piles removed	12
Brushes cut and removed	200
Loose stone removed..cubic yards	147
Dams built	3
Brush cut and boated for dams, cords	91
Fascines made	1,301

Money statement.

July 1, 1892, balance unexpended	$10,296.12
Amount appropriated by act approved July 13, 1892	75,000.00
	85,296.12
June 30, 1893, amount expended during fiscal year	16,294.82
July 1, 1893, balance unexpended	69,001.30
Amount (estimated) required for completion of existing project	457,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	250,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

COMMERCIAL STATISTICS.

Articles.	1893.	1892.
Cotton..........tons..	705	1,460
Grain..........do....	675	675
Iron..........do....	20	20
Lumber..........do....	25	25
General merchandise..........do....	1,172	1,753
Total	2,597	3,933

TOMBIGBEE RIVER FROM ITS MOUTH TO DEMOPOLIS.

Survey of this portion of the river was directed by the act of August 11, 1888.

Report upon the survey was submitted December 24, 1889. The project proposed was to obtain a channel of 6 feet depth at ordinary low water by the removal of snags, logs, and overhanging trees, dredging, bank revetment, and the construction of locks and dams. The length of the section of the river to be improved is 191 miles. The estimated cost is $508,808.

Appropriations for this work have been made as follows:

Act of—	
September 19, 1890	$55,000
July 13, 1892	125,000
Total	180,000

Operations prior to June 30, 1892, consisted in the preparation of the necessary plant, the removal of snags, logs, trees, etc., from the river for the distance of 12 miles from Demopolis downstream and 156 miles from its mouth upstream, the repair of old jetties at Osage and Barneys Shoals, and the partial improvement of the river by blasting and rock excavation at McGrews Shoals 63 miles, Woods Bluff 101 miles, and Pearsons Shoals 128 miles above the mouth.

Operations during the fiscal year ending June 30, 1893, were as follows: The removal of snags, logs, and trees was in progress at the beginning of the fiscal year at a point about 12 miles below Demopolis, and was continued downstream until stopped by high water on July 12, 54 miles of the river being worked over. Work was resumed on October 3, at a point about 2½ miles below Demopolis and was continued downstream as far as Turkey Shoals, a distance of 37 miles, where a suspension on account of high water became necessary in December. Work was again resumed in June, 1893, and continued till the end of the fiscal year.

Work was begun in November repairing jetties at Barneys Shoals, blasting rock at Pearsons Shoals, and dredging a channel through the gravel bar at Barneys Shoals, but high water in the early part of December caused a stoppage of these works before they had been fairly begun. The work of dredging was resumed in June, 1893, at Rainwater Bar, and continued till the end of the fiscal year. An examination of the sites for the locks and dams required by the existing project for the improvement of the river was made in October, 1892, and suggested some minor modifications to be made in the project, these being considered in a letter to the Chief of Engineers dated February 4, 1893. The preparation of plans for the locks and dams has been begun.

The following is a statement of work performed:

Overhanging trees felled, pulled back, and cut up		167
Number of cuts		401
Snags removed from river and cut up		373
Number of cuts		3,012
Stumps blasted, leveled, and removed		2
Piles cut for jetties		841
Gravel excavated	cubic yards	400
Sand excavated	do	375
Marl excavated	do	130
Clay excavated	do	867

The river is now navigable as far as Demopolis throughout the year for the class of boats now in operation upon it, but to keep it in this condition will require an annual appropriation of $10,000 for the pr ervation of the improvement; this should be made separately from t appropriation for the work proper. No further permanent impro ment can be obtained until the completion of the system of locks a dams included in the existing project.

Money statement.

July 1, 1892, balance unexpended	$6,812.
Amount appropriated by act approved July 13, 1892	125,000.
	131,812.
June 30, 1893, amount expended during fiscal year	20,595.
July 1, 1893, balance unexpended	111,216.
Amount (estimated) required for completion of existing project	328,808.
Amount that can be profitably expended in fiscal year ending June 30, 1895.	328,808.

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

COMMERCIAL STATISTICS.

Articles.		1893.	1892.
Cotton	tons	5,500	9,
Grain	do	4,444	7,
Iron	do	71	
Lumber and cross-ties	do	52,808	41,
Shingles	do	475	1,
General merchandise	do	11,244	17,
Total		74,542	77,

TOMBIGBEE RIVER FROM DEMOPOLIS, ALA., TO COLUMBUS, MISS.

Extending improvement to secure 6 feet draft at low water. Th survey of this section of the river was directed by the act of Augu 11, 1888. Report upon the survey was submitted December 24, 188 The project proposed was to obtain a channel of 6 feet draft by th removal of logs, snags and overhanging trees, bank revetment, ba improvement by contraction works, and dams and locks, at an est mated cost of $779,400.

The length of this portion of the river is 156 miles.

Appropriations have been made as follows:

Act of—	
September 19, 1890	$15,0
July 13, 1892	35,0
Total	50,0

Operations prior to June 30, 1892, consisted in the preparation the necessary plant, the removal of snags, logs, and overhanging tree from the river for the distance of 22½ miles from Windham downstrea and the removal of sunken obstructions at Ten Mile Shoals, 10 mil below Columbus.

Operations during the fiscal year ending June 30, 1893, were a follows:

The work of removing snags, logs, trees, etc., was begun in Se tember and continued till stopped by high water on February 21, 189

Work was resumed on June 1, 1893, and continued till the end of the fiscal year. One hundred and twenty-five miles of the river from Demopolis up to Pickensville was worked over, a large part of it twice.

The work performed was as follows:

Overhanging trees felled, cut up, and pulled back	5,160
Logs on bank cut up	281
Snags pulled, cut up, and removed	386
Stumps leveled, blasted, and removed	244
Bushes cut	13,050

An annual appropriation of $10,000 will be required for the preservation of this improvement of the river, and should be made separately from the appropriations for the work proper.

Money statement.

Amount appropriated by act approved July 13, 1892	$35,000.00
June 30, 1893, amount expended during fiscal year	10,575.28
July 1, 1893, balance unexpended	24,424.72
Amount (estimated) required for completion of existing project	729,400.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	250,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

COMMERCIAL STATISTICS.

Articles.		1893.	1892.
Cotton	tons..	2,000	2,000
Grain	do...	2,221	2,916
Iron	do...	29	25
Lumber	do...	5,950	5,[illegible]
General merchandise	do...	5,622	7,291
Total		15,822	12,[illegible]

TOMBIGBEE RIVER FROM FULTON TO COLUMBUS.

A survey of this section of the river (144 miles) was made under the act of June 10, 1872, and report of same submitted September 20, 1873. This report is contained in the Annual Report of the Chief of Engineers for 1873.

Previous to improvement navigation was carried on only during the winter (high water) season, and was seldom attempted above Aberdeen, 112 miles below Fulton. Snags, sawyers, and stumps obstructed the channel in low stages, so that navigation practically ceased on a stage 12 feet above low water.

Overhanging trees were troublesome at all stages and frequent cause of damage.

The normal width of the river on a navigable stage was from 80 to 120 feet.

The project adopted was to improve high water navigation from Fulton to Columbus by removing all timber obstructions above low water, and to clear the bank of overhanging trees.

The sum of $6,000 was appropriated by act of Congress of July 13, 1892.

Under this appropriation work was commenced at Fulto
ber, 1892, and continued up to June 30, 1893.

The following work was performed during the fiscal year
30, 1893:

Stumps, cut, leveled, and blasted
Snags cut up and removed
Logs on bank cut up and removed
Overhanging trees felled, pulled, and cut up
Drift piles removed

This work has resulted in giving a clear high-water chann
ton down to Wilson Landing, near Amory, Miss.; a di
miles, enabling rafts of logs and timber of much larger si
merly to be floated down with perfect safety, at a stage
low water.

It is proposed to apply the balance on hand, and any a
that may be made for the fiscal year ending June 30, 1
tinuing the improvement down to Columbus and in preserv
improvement.

Owing to caving banks and shifting of the channel the im
made are not permanent. It is estimated that an annual
of $5,000 will be required to maintain the river in the co
templated by the plan of improvement.

Money statement.

Amount appropriated by act approved July 13, 1892
June 30, 1893, amount expended during fiscal year

July 1, 1893, balance unexpended

Amount (estimated) required for preservation of improvement
Amount that can be profitably expended in fiscal year ending June 30, 18
Submitted in compliance with requirements of sections 2 of river a
harbor acts of 1866 and 1867 and of sundry civil act of March 3, 18

COMMERCIAL STATISTICS.

Downstream.

Articles.	Quant
Cypress logs .... tons..	
Ash logs .... do...	
Poplar logs .... do...	
Oak logs .... do...	
Pine logs .... do...	5,
Total	6,

From Fulton to Vienna.

Articles.
Lumber .... to

TOMBIGBEE RIVER FROM WALKERS BRIDGE TO FULTON.

The examination of this section of the Tombigbee River was provided for by the river and harbor act of March 3, 1881, and again by the river and harbor act of August 5, 1886.

An examination was made under the first act and a report was submitted February 10, 1882, which is contained in the Annual Report of the Chief of Engineers for 1882.

Under the second act reference was made to the examination previously made.

The following appropriations have been made for the improvement of this section of the river:

By act of—	
August 11, 1888	$4,000
September 19, 1890	4,000
July 13, 1892	3,000
Total	11,000

The projected improvement was the opening of a channel for high-water navigation from Fulton to Walkers Bridge by the removal of snags and overhanging trees, at an estimated cost of $11,000.

Work on the improvement of this river was commenced at Fulton on November 17, 1888, and continued to December 21, 1888 when work was suspended on account of high water; resumed March 15, 1889, and continued to the middle of August, 1889. Work under appropriation of $4,000 made by the act of September 19, 1890, was commenced in January, 1891, at Stevens Field, and carried on until a rise of the river caused suspension on February 4, 1891, and resumed again in March, and Walkers Bridge was reached on May 16, 1891.

On account of high water during March, April and May, 1891, considerable necessary work had to be passed over; it was deemed best to return downstream and go over the work again while the water was low.

The party working downstream reached Fulton on the 30th of June, 1891, and completed the projected improvement.

Work on the removal of the annual accumulation of snags, logs, and trees was again resumed at Walkers Bridge, in September, 1892, and suspended in November, 1892, when Fulton Ferry was reached.

The improvement made will not be permanent, but owing to caving banks and shifting of the channel will require reworking from time to time.

An annual expenditure of $2,500 will be required to maintain the river in the condition contemplated by the plan of improvement. The following obstructions were removed up to June 30, 1892:

Trees pulled	454
Trees cut	2,[illegible]
Logs removed	1,[illegible]
Drifts removed	4
Stumps removed	64[illegible]

The following obstructions were removed during the fiscal year ending June 30, 1893:

Trees felled, pulled back, and removed	2,239
Snags cut up and removed	25[illegible]
Stumps leveled and blasted	373
Drift piles removed	13

The results obtained by this improvement are as follows:

Rafts of timber of much larger size than before can be floated dow stream safely on a 3-foot rise above low water, and barges drawin feet water can be carried down safely on a 5-foot rise above low wat

Money statement.

July 1, 1892, balance unexpended	$408.
Amount appropriated by act approved July 13, 1892	3,000.
	3,408.
June 30, 1893, amount expended during fiscal year	2,279.
July 1, 1893, balance unexpended	1,129.
Amount (estimated) required for preservation of improvement	1,000.
Amount that can be profitably expended in fiscal year ending June 30, 1895	1,000.

Submitted in compliance with requirements of sections 2 river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

COMMERCIAL STATISTICS.

Downstream.

Articles.	1892.	1893.
	Tons.	*Tons*
Lumber and logs	11,880	8,2
Staves	32	
Firewood	756	......
Total	12,668	8,2

Q 4.

IMPROVEMENT OF NOXUBEE RIVER, MISSISSIPPI.

The examination of this river, provided for by act of Congress approved March 3, 1879, was made during the month of March, 1880, an extended from Macon, Noxubee County to its mouth.

Report is contained in the Annual Report of the Chief of Engineer for 1880. The condition of the river when examined was such tha during all seasons of the year and at all stages of water, navigation except by small flatboats, was practically impossible.

Steamboats prior to the building of the Mobile and Ohio Railroa (1859), plied the river. After the construction of this railroad th boats were withdrawn. The river banks then became overgrown wit timber, much of which in time fell or slid into the river, and caused th formation of a number of shoals and bars. The river being virtuall abandoned for the purpose of navigation, the planters living along it banks assisted in obstructing its channel way by building a number o fish traps and milldams. The chief obstruction to navigation consiste in the immense number of trees overhanging the river throughout it entire length.

At the time of the examination the minimum depth of the river was found to be (at ordinary low water) 1½ feet and the average width 60 feet.

The project adopted was to afford a navigable channel during high water, or about five months, to the town of Macon, by the removal of overhanging timber from the banks and such obstructions to navigation as might be found in the river.

The estimated cost was $65,245.25.

The appropriations made for the improvement are as follows:

By act of Congress—

June 14, 1880	$12,000	August 11, 1888	$5,000
March 3, 1881	8,000	September 19, 1890	3,000
August 2, 1882	10,000	July 13, 1892	3,000
July 5, 1884	7,500		
August 5, 1886	7,500	Total	56,000

Work was commenced on the improvement during the low-water season of 1880, prosecuted during the fiscal years ending June, 1881, and June 30, 1882, and through the month of March, 1883, from September, 1884, to January 12, 1885; from May 23, 1885, to September 23, 1885; from May 26, 1887, to December 15, 1887; from May 15, 1888, to July 20, 1888; from September 20, 1888, to December 8, 1888; from April 1, 1889, to October, 1889. The condition of the improvement at the end of the fiscal year is a completely improved channel from the mouth of the river up to Macon, 91½ miles, and the project may be considered to be completed.

Operations during the fiscal year ending June 30, 1893, were confined to the repair and alterations of steamer, and care and preservation of property.

The amount available, and any appropriation that may be made, will be applied to the maintenance of improvement.

The river during high water is navigable from its mouth to Macon. This work will require an annual expenditure of $3,000 to maintain it in its improved condition, and no further improvement should be considered until the Tombigbee River below Gainesville is completely improved.

The reduction in freight charges on cotton and produce by railroad due to the improvement of the river is estimated at not less, and probably much more, than $20,000 per annum.

Money statement.

July 1, 1892, balance unexpended	$3,100.71
Amount appropriated by act approved July 13, 1892	3,000.00
	6,100.71
June 30, 1893, amount expended during fiscal year	3,067.12
July 1, 1893, balance unexpended	3,033.59
Amount (estimated) required for preservation of improvement	6,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	6,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893	

Q 5.

IMPROVEMENT OF PASCAGOULA RIVER, MISSISSIPPI.

By act of—

March 2, 1827, an appropriation was made of	$8,000
May 23, 1828, an appropriation was made of	17,500
August 30, 1852, an appropriation was made of	5,000

The first appropriation was made for removing obstructions from the river and deepening the channel at its mouth, the second one was made for deepening the channel at its mouth, and the third was made for a survey of the river. There are no records in this office of the work done under these appropriations.

In 1870, March 1, a canal (called Noyes Canal) dredged across the bar at the mouth of the river, under a charter from the State of Mississippi to Abram A Green, to a depth sufficient to admit vessels of 6 feet draft at low tide, was opened by private parties.

The cost of the canal was stated to be $27,000, and for annual maintenance $4,000.

By the act of March 3, 1873, a survey was directed to be made at East Pascagoula Harbor, Mississippi Sound. This survey was made during the same year, and report was submitted October 23, 1873. The report is contained in the Annual Report of the Chief of Engineers for 1874. The plan adopted for the improvement was the dredging of a channel 200 feet wide and 7 feet deep at mean low water through the bar at the mouth of the river, and the removal of snags and overhanging trees throughout its entire length, at an estimated cost of $53,800.

The following appropriations were made to carry out this project:

By act of—		By act of—	
June 18, 1878	$10,000	August 2, 1882	$8,000
March 3, 1879	14,000	July 5, 1884	3,000
June 14, 1880	20,000		
March 3, 1881	4,000	Total	59,000

At the commencement of the work there was 3 feet on the crest of the bar at mean low water, and the river was much obstructed by snags, logs, and overhanging trees. Of the aggregate amount of the several appropriations made up to July 5, 1884, less $1,500 allotted for examination, $42,500 was devoted to dredging through the bar at the mouth, and resulted in securing a channel through the bar 180 feet to 190 feet wide, 7½ to 8 feet deep.

Fifteen thousand dollars of the amount appropriated up to that time was applied to the removal of snags, logs, and overhanging trees. Commencing at the light-house near the mouth of the river in the spring of 1882, the work was prosecuted during the working season of 1882, 1883, and 1884.

This portion of the work was completed on December 23, 1884, and resulted in securing a navigable channel from the mouth of the river to one-half mile above Dead Lake, 50½ miles, for vessels drawing 6½ feet, and to the junction of the Leaf and Chickasawha for vessels of lighter draft, during 6 or 8 months of the year. The project was then virtually completed.

By act of—

August 5, 1886, an appropriation was made of	$20,000
August 5, 1886, transferred amount appropriated for improving Horn Island Pass, Act of July 5, 1884	5,000
August 11, 1888, an appropriation was made of	27,000
September 19, 1890, an appropriation was made of	20,000
July 13, 1892, an appropriation of	20,000
Total	92,000

Under these appropriations a new project was proposed and approved for securing a channel of navigable width and minimum depth of 12 feet from Moss Point to the anchorage in the bay, at an estimated cost of $78,100, and maintaining, the river above Moss Point in its improved condition.

After due advertisement bids for dredging were opened August 17, 1887, and contract entered into with J. H. Gardner, September 15, 1887.

Dredging operations were commenced October 8, 1887, and completed April 28, 1888, and 113,529 cubic yards were removed. The wreck of the United States snag boat, sunk opposite Moss Point, was removed during May, 1888. Bids for improving Pascagoula River, Mississippi (dredging and building dam), were received and opened November 27, 1888, but prices (17½ cents for dredging and $3,700 for dam) were not satisfactory, and all were rejected.

Bids were again solicited, and opened January 20, 1890, and that of George C. Fobes & Co., for dredging, at 16.2 cents per cubic yard, and the Alabama Dredging and Jetty Company, for the dam, $3,350, accepted and contracts entered into.

Dredging was commenced April 16, 1890, and continued to the latter part of July 1890. The dam was completed in July, 1890.

Bids were solicited, and opened November 20, 1890, and the lowest, that of the Alabama Dredging and Jetty Company, at 22 cents per cubic yard measured in the scow, accepted and contract entered into.

Dredging was commenced in February, 1891, and continued to September 25, 1891.

Under the contract with George C. Fobes & Co., 73,619 cubic yards were removed, and under that of the Alabama Dredging and Jetty Company 86,598 cubic yards were removed up to the 25th of September, 1891. At the beginning of the work under the new project there was a depth of 7 feet through the bar at the mouth of the river, obtained by dredging under the previous project, and a least depth of 9 feet in the river up to Moss Point. Under the new project the work under the first contract was devoted to deepening the cut through the bar at the mouth of the river, and a channel of navigable width and 9½ feet depth obtained. Under the second contracts operations were carried on in the river between Moss Point and the mouth, and a channel of 80 feet wide and 12 feet deep was obtained.

Under the third contract the work was devoted to deepening the channel through the bar at the mouth of the river to 12 feet.

Bids were solicited and opened September 28, 1892, and the lowest, that of the Alabama Dredging and Jetty Company, at 18 cents per cubic yard measured in the scow, accepted and contract entered into.

Dredging operations were commenced October 12, 1892, and continued until December 19, 1892.

Under the fourth contract operations were carried on at the mouth of Pascagoula River, and were devoted to the dredging of a cut through the bar to a point 10.049 feet south of the mouth of the river, securing a depth of 12 feet and a width of 80 feet for a distance of 6,112 feet, and a width of 120 feet for a distance of 3,960 feet.

Under the fourth contract with the Alabama Dredging and Jetty Company 99,977 cubic yards were removed to December 19, 1892.

The amount estimated for completion is in excess of the original estimate, the reasons for which are that, owing to the extreme hardness of a portion of the bottom to be dredged and the smallness of the appropriations made available, the cost of excavation is in excess of that originally estimated.

Statement of work done under the above appropriations

Date of act.	Name of contractor.	Contract price measured in scow.	Cubic yards removed.	Comme
		Cents.		
Aug. 5, 1886	J. H. Gardner	18.4	113,529	Oct. 8
Aug. 11, 1888	George C. Fobes & Co	16.2	73,619	Apr. 16
Do	Alabama Dredging and Jetty Co*			
Sept. 19, 1890	do	22	86,598	Feb. —
July 13, 1892	do	18	99,977	Oct. 12,

Date of act.	Name of contractor.	Plant.	
		Apparatus.	Capacity of bucket.
Aug. 5, 1886	J. H. Gardner	1 scoop dredge, 1 clam-shell dredge, 4 scows, 2 tugs.	2 cubic yards 4 cubic yard
Aug. 11, 1888	George C. Fobes & Co	1 clam-shell dredge, 2 scows, 2 tugs.	3½ cubic yard
Do	Alabama Dredging and Jetty Co*		
Sept. 19, 1890	do	1 scoop dredge, 1 clam-shell dredge, 4 scows, 2 tugs.	2 cubic yards 4 cubic yard
July 13, 1892	do	2 clam-shell dredges, 4 scows, 2 tugs.	4 cubic yards 4½ cubic yard

* Submerged dam at Lowry Island 270 linear feet with wings (riprap) commen
completed July 16, 1890, at a cost of $3,350.

Work on the river above Moss Point was commenced
1891, suspended January 31, 1892, on account of high w
October 1, 1892, and suspended December 15, 1892, o
high water.

Fifty-five miles of river, from Moss Point up to Cart
have been improved in accordance with the adopted proje
to caving banks and shifting of the channel will have
over again from time to time, an annual expenditure of $
required to maintain the river in its improved condition.

The following is a statement of work performed duri
year ending June 30, 1892.

Snags pulled and removed
Number of cuts made
Sunken logs and trees pulled and removed
Number of cuts
Overhanging trees felled, pulled back and cut up
Number of cuts made

The following is a statement of work performed duri
year ending June 30, 1893.

Snags pulled and removed
Stumps leveled, blasted and removed
Logs on bank cut up
Overhanging trees felled, pulled back, cut up and removed

The condition of this river on June 30, 1893, is such as t
of 4 feet draft of water, to navigate safely on a low stage
Moss Point to Carters Landing 55 miles.

It is proposed to apply any appropriations that may be made for the fiscal year ending June 30, 1895, to improving the river from Carters Landing, up, and in preservation of the improvement already made.

The extent and present condition of the work is as follows:

Extent.	Condition.
I. Snagging and cutting overhanging trees from head to mouth.	Complete, but needs reworking in preservation of improvement.
II. Dredging channel from Moss Point to mouth of navigable width and 12 feet depth and construction of dam at Lowry Island.	Complete to a width of 80 feet and in good condition when last examined. Dam completed.
III. Dredging channel of navigable width and 12 feet depth from the mouth to the 12-foot curve in Mississippi Sound length of 18,898 feet.	Completed to a width of 80 feet for a distance of 6,112 feet; and to a width of 120 feet for a distance of 3,960 feet.

Money statement.

July 1, 1892, balance unexpended	$1,733.16
Amount appropriated by act approved July 13, 1892	20,000.00
	21,733.16
June 30, 1893, amount expended during fiscal year	20,954.49
July 1, 1893, balance unexpended	778.67
Amount (estimated) required for completion of existing project	49,000.00
Amount (estimated) required for preservation improvement above Moss Point	20,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	69,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March, 3, 1893.	

COMMERCIAL STATISTICS.

Description.	Entries.						Clearances.					
	1893.			1892.			1893.			1892.		
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.
Foreign	249	130,104	3,735	....	104,076	....	245	120,099	3,675	....	110,887	....
Coastwise	28	11,200	224	....	31,451	....	73	29,200	584	....	35,115	....
American	104	20,800	624	....	....	....	106	21,200	636	....	....	....
Total	381	162,104	4,583	....	135,527	....	424	170,499	4,895	....	146,002	....

Imports and exports for fiscal year ending June 30, 1893.

Description.	Value.
Duties on imports	$166.00
Tonnage dues	8,114.28
Official fees	1,578.81
Care and treatment of foreign sailors and overtime of officers	189.59
Fines, penalties, and forfeitures	83.50
Total	10,132.18
Domestic exports	1,038,597.00

COMMERCIAL STATISTICS, PASCAGOULA RIVER ABOVE MOSS POINT, MISS.

Downstream.

Articles.	Tons.	Value.
Logs and square timber	159,917	$958,800
Resin	1,400	15,000
Turpentine	300	24,000
Total	161,414	997,800

Upstream.

Articles.	Tons.
General merchandise	2,500

Q 6.

IMPROVEMENT OF CHICKASAHAY RIVER, MISSISSIPPI.

The act of Congress of August 11, 1888, provided for an examination of the Chickasahay River from its mouth to Enterprise. This examination was made, and report submitted on February 16, 1889.

The approved project is to clear the channel from the mouth up to railroad bridge near Shubuta, by the removal of logs, snags, and overhanging trees, at an estimated cost of $30,000.

The following appropriations have been made:

By act of—	
September 19, 1890	$5,000
July 13, 1892	5,000
Total	10,000

Under these appropriations work was commenced at Waynesboro, Miss., October 13, 1891, suspended December 12, 1891, on account of high water; resumed in September, 1892, and suspended in December, 1892, on account of high water.

The work performed up to June 30, 1892, was as follows:

Overhanging trees felled and cut up	4,500
Number of cuts made	5,000
Overhanging trees trimmed	1,500
Logs on bank cut up	6,000

The following work was performed during the fiscal year ending June 30, 1893:

Snags cut and removed		8,890
Stumps leveled and blasted		1,028
Overhanging trees felled and cut up		2,729
Trees trimmed		4,332
Logs on bank cut up		7,075
Bushes cut		12,810
Rock blasted and excavated	cubic yards..	28
Clay excavated and removed	do....	12

The results obtained by this work is as follows: Much larger rafts of logs and timber can be floated downstream from the railroad bridge near Shubuta at a considerably lower stage of water than formerly with safety.

The saving to producers by improvement proposed is estimated at about $50,000 annually.

This improvement is not permanent, owing to caving banks and shifting of the channel, an annual expenditure of $2,000 will be required to maintain the river in the condition contemplated by the plan of improvement.

It is proposed to apply any appropriation that may be made for the fiscal year ending June 30, 1895, to continuing the improvement, and to remove the annual accumulation of logs, snags, trees, etc., and in preservation of the improvements.

Money statement.

July 1, 1892, balance unexpended	$404.73
Amount appropriated by act approved July 13, 1892	5,000.00
	5,404.73
June 30, 1893, amount expended during fiscal year	1,851.19
July 1, 1893, balance unexpended	3,553.54
Amount (estimated) required for completion of existing project	20,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	20,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

COMMERCIAL STATISTICS.

Downstream.

Articles.	1893.		1892.	
	Tons.	Value.	Tons.	Value.
Lumber and logs	6,894	$210,400.00	347	$32,197.00

Q 7.

IMPROVEMENT OF BUFF CREEK, MISSISSIPPI.

An act of Congress, of August 11, 1888, directed that an examination of this creek should be made from its mouth to the head of navigation.

The examination was made and report submitted February 16, 1889.

The project proposed consisted in the removal of snags, logs, and overhanging trees from the mouth up to Vancleaves, at an estimated cost of $1,000.

By an act of Congress approved September 19, 1890, $1,000 was appropriated for this work.

Work was commenced in December, 1891, and suspended in February, 1892.

The following work was performed during the fiscal year ending June 30, 1892:

Overhanging trees felled and cut up	500
Overhanging trees felled and pulled back	3,500
Snags cut in the water with saws	49
Snags removed	92
Stumps removed, leveled	341

This stream has been fully improved and the project completed.

Money statement.

July 1, 1892, balance unexpended	$0.49
June 30, 1893, amount expended during fiscal year	.49

COMMERCIAL STATISTICS.

Vessels engaged.

	1893.		1892.	
	No.	*Tons.*	*No.*	*Tons.*
Coastwise	32	700	32	700

Articles shipped up and down stream.

Articles.		1893.		1892.	
		Amount.	Value.	Amount.	Value.
Charcoal	barrels	450,000	$60,000	374,000	$50,490
Saw logs, fine	number	12,000	24,000	9,000	18,000
Hewn timber	pieces	600	7,200	....	....
General merchandise	tons	1,100	75,000	1,000	50,000
Total		....	166,200	....	118,490

Q 8.

IMPROVEMENT OF LEAF RIVER, MISSISSIPPI.

The act of Congress of August 11, 1888, provided for an examination of Leaf River from its mouth to mouth of Bowie Creek, near the New Orleans and North Eastern Railroad. This examination was made and report submitted on February 15, 1889.

The approved project is to clear the channel from the mouth of Bowie Creek, for high water navigation, by the removal of snags, logs, and overhanging trees, at an estimated cost of $25,000.

The following appropriations havé been made:

By act of—	
September 19, 1890	$5,000.00
July 13, 1892	5,000.00
Total	10,000.00

Work on this improvement was commenced during August, 1891, at Hattiesburg, Miss., suspended November, 1891, resumed December 3, 1892, and suspended December 31, 1892, on account of high water.

The following work was performed up to June 30, 1892:

Snags pulled and cut up	1,070
Sunken logs and trees removed	110
Overhanging trees felled and cut up	1,100
Overhanging trees felled and pulled back	1,056
Logs on bank cut up	273
Stumps leveled, blasted, and removed	325

The following work was performed during the fiscal year ending June 30, 1893.

Snags pulled, cut up, and removed	405
Stumps removed and blasted	39
Overhanging trees felled, cut up, and removed	87
Trees trimmed	143
Bushes cut and removed	1,700

This work has resulted in giving a high-water channel, by removal of snags, logs, trees, etc., from Hattiesburg, Miss., to Augusta, a distance of 40 miles, and from the mouth of the river up to Doddrills Landing, 15 miles.

Owing to caving banks and shifting of the channel this work will not be permanent, but will have to be worked over from time to time.

An annual expenditure of $1,500 will be required to maintain the river in the condition contemplated by the plan of improvement.

Money statement.

July 1, 1892, balance unexpended	$402.14
Amount appropriated by act approved July 13, 1892	5,000.00
	5,402.14
June 30, 1893, amount expended during fiscal year	527.92
July 1, 1893, balance unexpended	4,874.22
Amount (estimated) required for completion of existing project	15,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	15,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

COMMERCIAL STATISTICS.

Up and down stream.

Articles.	1893.		1892.	
	Tons.	Value.	Tons.	Value.
Logs and lumber	52,064	$355,400	162	$11,836.03
General merchandise	25	25,500		
Total	52,089	357,900	162	11,836.03

Q 9.

IMPROVEMENT OF HARBOR AT BILOXI BAY, MISSISSIPPI.

The examination of this harbor, provided for by the third section of the river and harbor act of March 3, 1881, was made during the months of August and September, 1881.

The report is contained in Annual Report of Chief of Engineers, 1882, Appendix K 27.

The examination showed that between the roadstead and the Back Bay are situated a series of mud flats, called Deer Island Flats, about 1¼ miles east of Biloxi, having a present depth of 4 feet.

The improvement understood to be desired was to secure through these flats a channel 8 feet deep.

The estimated cost of the work by dredging was $35,000. The act of Congress, August 2, 1882, appropriated $5,000 for the improvement of the roadstead. No project was submitted, the amount appropriated being deemed insufficient for an economical prosecution of the work. Authority was therefore obtained to defer all action until a further appropriation was made. The act of July 5, 1884, directed that the balance of the money heretofore appropriated for the roadstead be applied to the deepening of the channel from Mississippi Sound to the wharves of Biloxi. The desired improvement was the deepening of the channel from Mississippi Sound to the wharves of Biloxi from 4½ feet, the least depth at that time, to 8 feet, and the estimated cost was $55,000.

It was not deemed economical or judicious to commence the work with the small amount on hand. Authority was therefore obtained to hold the appropriation until a further one was made to justify a call for bids.

The river and harbor act of August 5, 1886, appropriated $12,500, thus affording, with the balance on hand, the sum of $17,488.55 for carrying on the work of improvement.

The plans and estimates heretofore submitted were based upon an examination only (not sufficient for laying out the work properly), the limit of time and money preventing a complete survey; therefore a careful survey of the channel from Mississippi Sound to the wharves of Biloxi to locate channel to be dredged was recommended to be made.

This recommendation was approved and $900 from the amount available was allotted to the work.

A project and estimates based on the survey made in April and May, 1887, were submitted July 8, 1887, and approved July 13, 1887.

The sum of $16,523.64 was available July 1, 1887, for the improvement of this harbor.

Advertisement and specifications for dredging were prepared and published, bids were opened August 17, 1887, a contract was entered into with George C. Fobes & Co., of Baltimore, Md., at 17 cents per cubic yard, and dredging operations were commenced September 12, 1887, and completed March 2, 1888. Eighty-four thousand six hundred and eighty-six cubic yards of material were removed.

Bids for improving Biloxi Harbor, Mississippi (dredging), were received and opened November 27, 1888, but as prices (16½ cents per cubic yard) were not satisfactory all were rejected.

Bids were again solicited and opened January 20, 1890, and contract awarded to Alabama Dredging and Jetty Company at 14⅜ cents per cubic yard, measured in the scow. Work commenced July 14, 1890, and continued to November 12, 1890, at which time 97,092 cubic yards had been excavated and the project virtually completed, although a greater width is considered advisable.

Extent.	Present condition.
Dredging a channel of 8 feet depth and navigable width through the bar across the west entrance to Biloxi Bay from Mississippi Sound, a distance of 5,351 feet.	Completed to a depth of 9 feet and width of 120 feet, and when last sounded was in good condition, with not less than 8 feet throughout the dredged channel.

The present project is therefore completed, but the amount on hand can be used to advantage in improving the channel.

An examination of the dredged channel was made during May, 1892, and it was ascertained that the depth of 8 feet had been maintained; but an accumulation of soft black mud slightly mixed with very fine sand was found opposite the first turning point at the intersection of Reaches 1 and 2, and from the second turning point the intersection of Reaches 3 and 4, 650 feet south, where the excavation crosses the bar formation on west spit of Deer Island.

Bids for improving Biloxi Harbor, Mississippi (dredging), were solicited and opened July 18, 1892, but, as prices (18¾ cent per cubic yard) were not satisfactory, were rejected.

Bids were again solicited and opened September 28, 1892, and contract awarded to Alabama Dredging and Jetty Company at 18 cents per cubic yard, measured in the scow. Work commenced December 28, 1892, and continued to January 9, 1893, at which time 12,678 cubic yards were removed from the channel, when, owing to the extreme low stage of water, the contractors were granted three extensions, as it was deemed advisable to postpone further dredging operations until a time when high tides would prevail, and it is expected that work will be again resumed in the early part of July, 1893.

Money statement.

July 1, 1892, balance unexpended		$10,851.36
June 30, 1893, amount expended during fiscal year		2,227.20
July 1, 1893, balance unexpended		8,624.16
July 1, 1893, outstanding liabilities	$228.19	
July 1, 1893, amount covered by uncompleted contracts	8,395.97	
		8,624.16

COMMERCIAL STATISTICS.

Articles.	1893.		1892.	
	Tons.	Value.	Tons.	Value.
Lumber, timber, and deals	19,845	$1,763,872.96	4,500	$378,000

Q 10.

IMPROVEMENT OF PEARL RIVER BELOW JACKSON, MISS.

The original project for improving this section of the river was adopted in 1880, the object being to obtain a navigable channel 5 feet deep at low water from Jackson down to the mouth by the removal of snags, stumps, roots, logs, and trees, and clearing the banks of overhanging trees, at an estimated cost of $95,940, based upon the report of a survey made under direction of Capt. C. W. Howell, Corps of Engineers, U. S. Army, during March and April, 1879.

Upon an examination made in December, 1884, it was found that a 5-foot channel at low water was not practicable by the method proposed, but that a 2-foot channel at low water could be obtained in that manner, and was all that the present commerce of the river required. Upon that examination the original estimate was increased $50,000. (See Annual Report 1885–'86, p. 1367.)

In addition to the improvement of the river proper, the increased lumber trade of the mills situated on the river demands the dredging of the channel over the bar at the mouth of "east Pearl River" to 12 feet, a rough estimate of the cost of which is $20,000.

The following appropriations have been made:

By act of—		By act of—	
June 14, 1880	$30,000	August 11, 1888	$15,000
March 3, 1881	25,000	September 19, 1890	20,000
August 2, 1882	15,000	July 13, 1892	15,000
July 3, 1884	10,000		
August 5, 1886	13,125	Total	143,125

Under these appropriations work was commenced by contract in December, 1880. Working from Jackson down, 295 miles of river were partially improved.

August 23, 1882, contract work was completed and accepted.

In November, 1882, work on the improvement by hired labor was commenced, and was suspended in November, 1883; resumed in June, 1884; suspended on September 1 on account of high water; resumed December 1, 1884; suspended June 30, 1885, on account of lack of funds; resumed in September, 1885; suspended March 30, 1886, on account of lack of funds; resumed September 5, 1886; suspended November 22, 1887, on account of lack of funds; resumed October 20, 1888; suspended October 23, 1889, on account of lack of funds; resumed in July, 1891; suspended in May, 1892, on account of high water; resumed in November, 1892, and suspended in January on account of high water.

The following is a statement of work performed from 1884 up to June 30, 1892:

Snags removed		7,508
Roots removed		6,808
Sunken logs removed		5,372
Sunken trees removed		3,037
Stumps removed		2,264
Knees removed		87
Standing trees removed		1,693
Overhanging trees removed		26,518
Logs on bank cut up		69
Trees deadened		2,936
Trees trimmed		69
Brushes cut		282
Drifts removed piles		9
Sand and clay removed	cubic yards	11,739¼
Cane cut and removed	running yards	9,422
Piles driven for jetties		256
Willows planted for jetties	cords	666
Trees felled, moved, and sunk for jetties		1,531
Sunken logs and trees pulled and sunk for jetties		116
Willows cut and made into mattresses for jetties	cords	618¼
Clay dug, wheeled, transported, and sunk for jetties	cubic yards	3,220

The following is a statement of work performed during the fiscal year ending June 30, 1893:

Snags removed	749
Stumps removed	41
Overhanging trees removed	6,394
Logs on bank cut up	56
Trees trimmed	5
Brushes cut	835
Drifts removed	52

Bids for dredging through the bar at the mouth of east Pearl River were solicited in January, 1893, opened in March, 1893, but were rejected, the price bid being considered too high.

Nearly one-half of the amount appropriated has been expended in the removal of the annual accumulation of snags, logs, etc., and in preservation of the improvement. Fifty-five and one-half miles from the mouth up were improved in accordance with the adopted project. Fifty and one-half miles of river, up to Wheats Fields, were improved for a 100-foot-wide channel, and fifty miles of river, from Wheats Fields to Columbia, Miss., have been partially improved. From Columbia to Jackson the river has been partially improved by contract. No other work has been done on that section since, and it remains in about the same condition.

The condition of this section of the river on June 30, 1893, is such as to allow light-draft boats to navigate from the mouth, at the Rigolets, Louisiana, to Wheat Fields, Mississippi, 106 miles, all the year; from Wheat Fields to Columbia, Miss., 50 miles, on a 6-foot rise, and from Columbia, Miss., to Jackson, Miss., 169 miles, on a 7-foot rise, and then it is dangerous.

The benefits that are derived by the improvements of this section of the river are greater security to navigation between New Orleans, La., and Columbia, Miss., and other towns and settlements situated on the river, and reduced rates of freights and insurance on merchandise and produce.

Large tracts of rich and valuable bottom lands have been reclaimed by the improvement and are now being cultivated.

It is proposed to apply any appropriation that may be made for the fiscal year ending June 30, 1895, to continuing the improvement of the river for a 2-foot channel at low water between Columbia and Jackson.

It is also proposed to apply any appropriation that may be made for the fiscal year ending June 30, 1895, for deepening the channel over the bar at the mouth of east Pearl River and to dredging a channel 12 feet deep at mean low water, so far as the funds will permit.

Owing to caving banks and shifting of the channel, the improvements so far made and contemplated are not permanent. An annual expenditure of $5,000 will be required to maintain the river in the condition contemplated by the plan of improvement.'

Money statement.

July 1, 1892, balance unexpended	$11,862.77
Amount appropriated by act approved July 13, 1892	15,000.00
	26,862.77
June 30, 1893, amount expended during fiscal year	3,902.33
July 1, 1893, balance unexpended	22,960.44
Amount (estimated) required for completion of existing project	20,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	20,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

COMMERCIAL STATISTICS.

Comparative statement of vessels employed on Pearl River, below Jackson.

Class.	1893.		1889.	
	No.	*Tons.*	*No.*	*Tons*
Steamboats	11	1,400	9	1,[illegible]
Schooners	61	25,000	64	25,[illegible]
Lighters and flatboats	22	1,300	16	1,[illegible]
Total	94	27,700	89	27,7[illegible]

Comparative statement of staple articles transported on Pearl River, Mississippi, below Jackson.

UPSTREAM.

Articles.	1893.		1889.	
	Number.	Value.	Number.	Value.
Fertilizers..........tons..	1,600	$40,000	2,500	$50,000
Grain..........do...	1,900	35,000	1,600	25,000
Machinery, etc..........do...	500	25,000	400	20,000
General merchandise..........do...	13,000	350,000	10,000	300,000
Total..........	17,000	450,000	14,500	395,000

DOWNSTREAM.

Articles.	1893.			1889.		
	Unit.	Number.	Value.	Unit.	Number.	Value.
Cotton..........	Tons....	700	$140,000	Bales...	3,000	$150,000
Produce..........	...do....	60	3,000	....	....	....
Rice..........	...do....	....	....	Barrels.	500	7,500
Turpentine..........	...do....	45	3,600	...do....	100	1,200
Rosin..........	...do....	180	3,600	...do....	500	1,000
Staves..........	...do....	8	1,620	No......	10,000	1,000
Wool..........	...do....	15	9,000	....	....	....
Firewood..........	...do....	125	1,500	Cords...	8,000	32,000
Fowls and eggs..........	...do....	....	....	Dozen..	2,000	3,000
Sawlogs, pine..........	...do....	140,000	560,000	No......	400,000	800,000
Sawlogs, cypress..........	...do....	500	40,000	...do....	10,000	70,000
Lumber:						
Foreign..........	...do....	33,000	435,000	Feet....	23,038,257	279,262
Coastwise..........	...do....	10,500	145,000	...do....	15,892,014	175,812
Charcoal..........	...do....	40	480	....	....	....
Total..........	....	185,173	1,342,800	....	....	1,520,774

Q 11.

IMPROVEMENT OF PEARL RIVER BETWEEN CARTHAGE AND JACKSON, MISS.

The original condition of this portion of the river was such as to permit navigation only during high water, and even then it was difficult and dangerous.

An examination of this part of the river was made in 1879, and report thereon is contained in the Annual Report of the Chief of Engineers of 1879 (Appendix K 2).

The original project for the improvement of this part of the river consisted in the removal of snags, logs, and overhanging trees, etc., and was to afford a clear channel of navigable width, 5 feet deep at a low stage of water, from Carthage to Jackson, a distance of 105 miles, at an estimated cost of $21,000.

An examination made in January, 1887, showed that a clear channel of 5 feet at low water was not practicable by the method proposed on this section of the river, but that a 2-foot channel at low water could be obtained in that manner, and was all that the present commerce of the river required.

Upon that examination the original estimate of the cost of the improvement was increased $29,000. (See Annual Report 1886–'87, Part II, p. 1336.)

The following appropriations have been made:

By act of—		By act of—	
March 3, 1879	$6,000	August 11, 1888	$2,500
June 14, 1880	7,500	September 19, 1890	3,000
March 3, 1881	2,500	July 13, 1892	5,000
August 2, 1882	2,500		
August 6, 1886	2,250	Total	31,250

Under these appropriations work was commenced by contract November 20, 1879. The work, however, not proving satisfactory, the contracts were annulled September 22, 1882, and the work was continued by hired labor during the low-water seasons of 1883 and 1884; suspended in January, 1885, on account of lack of funds; resumed January 1, 1887; suspended January 29, 1887, on account of high water; resumed August 1, 1887; suspended November 30, 1887, on account of lack of funds; resumed in September, 1888; suspended December 31, 1888, on account of high water; resumed November 16, 1890; suspended in January, 1891, on account of high water; resumed July 1, 1891, and suspended August 30, 1891, on account of lack of funds; resumed June 1, 1893.

The following is a statement of work performed up to June 30, 1892:

Snags cut up and removed	40,310
Stumps cut, leveled, and blasted	1,958
Logs on banks cut up and removed	1,703
Sunken logs cut and removed	5,148
Sunken trees cut and removed	793
Drift piles removed	8
Overhanging trees felled, pulled back, and removed	4,210
Trees trimmed	187
Bushes cut	9,375

The following is a statement of work performed during the fiscal year ending June 30, 1893:

Snags cut up and removed	540
Stumps leveled, blasted, and removed	75
Logs on bank cut up and removed	130
Overhanging trees felled, pulled back, and removed	686
Trees trimmed	102
Bushes cut	1,830

One and one-half miles of river from Carthage down were improved.

About one-half of the appropriations have been expended in the removal of the annual accumulation of snags, logs, etc., or in preservation of the improvements.

The entire distance of this part of the river from Carthage to Jackson, 105 miles, has been improved in accordance with the plan of improvement, but, owing to caving banks and shifting of the channel, will have to be worked over again from time to time.

An annual expenditure of $2,400 will be required to maintain the river in the condition contemplated by the plan of improvement.

The condition of the river on June 30, 1893, is such as to allow light-draft boats to navigate safely in a 3-foot rise above ordinary low water from Carthage down to Jackson.

The reduction and saving in railroad freights, as well as the reduced rates of insurance on freights both up and down stream, due to river competition, are considerable.

It is proposed to apply any appropriation that may be made for the fiscal year ending June 30, 1895, to remove the annual accumulation of logs, snags, trees, etc., and in preservation of the improvements.

Money statement.

July 1, 1892, balance unexpended	$182.62
Amount appropriated by act approved July 13, 1892	5,000.00
	5,182.62
June 30, 1893, amount expended during fiscal year	185.11
July 1, 1893, balance unexpended	4,997.51
Amount (estimated) required for preservation of improvement	2,400.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	2,400.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.

COMMERCIAL STATISTICS.

Vessels engaged on river.

Class.	1893.			1892.		
	Length.	Draft.	Tonnage.	Length.	Draft.	Tonnage.
	Feet.	*Feet.*		*Feet.*	*Feet.*	
One sternwheel steamboat	110	3	90	110	3	90
One propeller	40	3	50	40	3	50
Six flatboats	50	1½	250	50	1½	250

Carried upstream.

Articles.	1893.		1892.	
	Tons.	Value.	Tons.	Value.
General merchandise	750	$75,000	900	$45,000
Grain	120	4,800	400	8,000
Fertilizers	200	5,000	500	10,000
Machinery	12	1,200	100	8,000
Total	1,082	86,000	1,900	71,000

Carried downstream.

Articles.	1893.		1892.	
	Tons.	Value.	Tons.	Value.
Cotton	325	$65,000	700	$120,000
Staves	37	1,800	230	3,000
Lumber	35	276	300	7,200
Shingles	....	....	50	1,000
Firewood	756	900	2,000	7,500
Saw logs	1,055	19,000	2,000	26,000
Produce	20	1,000	30	1,500
Wool	13	7,800	....	....
Total	2,241	95,776	5,310	176,200

Q 12.

IMPROVEMENT OF PEARL RIVER, BETWEEN EDINBURG AND CARTHAGE, MISSISSIPPI.

A survey of this part of Pearl River was made during the month of November, 1883, and report thereon is contained in the Annual Report of the Chief of Engineers of 1884 (Appendix Q 18).

The original project for the improvement of this river was to afford a high-water channel from Edinburg to Carthage, a distance of 24¾ miles, for six or eight months of the year, at an estimated cost of $13,464.

The following appropriations have been made:

By act of—	
July 5, 1884	$2,500
August 5, 1886	2,250
August 11, 1888	5,000
September 19, 1890	5,000
July 13, 1892	500
Total	15,250

Under these appropriations work was commenced November 17, 1884; suspended January 23, 1885, on account of high water; resumed September 3, 1885; suspended September 30, 1885, on account of lack of funds; resumed November 16, 1886; suspended December 18, 1886, on account of high water; resumed December 1, 1887; suspended December 27, 1887, on account of high water; resumed June 1, 1889; suspended December 12, 1889, on account of high water; resumed in September, 1891, suspended January, 1892, on account of high water; resumed in October, 1892, and suspended in February, 1893, on account of high water.

The following is a statement of work performed up to the fiscal year ending June 30, 1892:

Snags, stumps, logs, and trees cut up and removed		148,829
Standing trees in channel removed		368
Fallen trees removed		94
Overhanging trees cut, pulled back, and removed		16,104
Banks cleared of brush	yards..	6,491
Trees trimmed		638
Bushes cut		21,735

The following is a statement of work performed during the fiscal year ending June 30, 1893:

Snags cut up and removed	9,080
Stumps cut, blasted, and removed	1.257
Logs on bank cut up	1,637
Overhanging trees cut, pulled back, and removed	5,597
Trees trimmed	598
Bushes cut	28,380
Drift piles removed	40

The entire distance of this part of the river, from Edinburg to Carthage, 24¾ miles, has been fully improved and the project completed.

Nearly the whole of the last appropriation of $5,000 has been expended in the removal of the annual accumulation of snags, logs, and trees, and in the preservation of the improvement.

The condition of this portion of the river on June 30, 1892, was such as to allow light-draft boats to navigate with comparative safety from Edinburg to Carthage on a 4-foot rise above ordinary low water.

The condition of this portion of the river on June 30, 1893, was such as to allow light-draft boats to navigate safely from Edinburg to Carthage on a 4-foot rise above ordinary low water.

Owing to caving banks and shifting of the channel, the improvements made are not permanent. It is estimated that an annual expenditure of $500 will be required to maintain the river in the condition contemplated by the plan of improvement.

The reduction in freights and insurance due to the river competition are considerable.

Money statement.

July 1, 1892, balance unexpended	$2,374.30
Amount appropriated by act approved July 13, 1892	500.00
	2,874.30
June 30, 1893, amount expended during fiscal year	2,351.89
July 1, 1893, balance unexpended	522.41
Amount (estimated) required for preservation of improvement,	500.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	500.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

COMMERCIAL STATISTICS.

Upstream.

Articles.	1893.		1892.	
	Tons.	Value.	Tons.	Value.
General merchandise, grain, fertilizer, furniture, machinery	570	$50,000	1,000	....

Downstream.

Cotton and country produce, wool	250	$55,000	450	....

Vessels employed.

	Sternwheel steamboat.	
	1893.	1892.
Number	1	1
Length ....feet	100	110
Draft ....do	3	3
Tonnage ....tons	90	90

Q 13.

IMPROVEMENT OF BOGUE CHITTO, LOUISIANA.

An act of Congress of August 11, 1888, directed an examination of this river to be made.

The examination was made and report submitted June 24, 1889. The project proposed consisted in closing the west mouth and the removal of snags, logs, overhanging trees, and fish traps from the other mouth, and up to Alford's Bridge, so that the river could be used by small river steamers of 3 feet draft the greater part of the year.

The estimated cost was $55,000.

The following appropriations have been made:

By act of—	
September 19, 1890	$5,000
July 18, 1892	5,000
Total	10,000

The first appropriation made was to be expended in the removal of snags, logs, trees, etc., from the mouth up to where the first bridge obstructing the navigation is located.

No work was done on this river during the fiscal year ending June 30, 1892.

The work performed during the fiscal year ending June 30, 1893, consisted in commencing and nearly completing the construction of a snag boat and a barge.

The annual saving in freight that would be affected by the improvement of this river to the present commerce is estimated at about $30,000.

It is proposed to apply any appropriation that may be made for the fiscal year ending June 30, 1895, to the removal of snags, logs, trees, etc., and the clearing of the banks of overhanging trees.

Money statement.

July 1, 1892, balance unexpended	$4,000.00
Amount appropriated by act approved July 13, 1892	5,000.00
	9,000.00
June 30, 1893, amount expended during fiscal year	2,072.40
July 1, 1893, balance unexpended	6,927.60
Amount (estimated) required for completion of existing project	45,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895	20,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	

COMMERCIAL STATISTICS.

Downstream.

Articles.	1893.		1892.	
	Tons.	Value.	Tons.	Value.
Saw logs	5,100	$29,600	6,375	$34,000
Hewn timber	1,584	13,200	1,584	13,200
Total	6,684	42,800	7,954	47,200

Q. 14.

REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGERING NAVIGATION.

REMOVAL OF SUNKEN DRY DOCK IN MOBILE RIVER, ALABAMA.

Under date of April 11, 1893, authority was requested to remove wreck of sunken dry dock in Mobile River, Alabama.

Upon recommendation of the Chief of Engineers, dated April 21, 1893, the honorable Secretary of War authorized the removal of sunken dry dock, and an allotment of $3,000 made for that purpose from the permanent, indefinite appropriation for "removing sunken vessels or craft obstructing or endangering navigation," act of June 14, 1880, to pay the attendant expenses of the work.

Advertisements inviting proposals for the removal of sunken dry dock were published May 25, 1893, and proposals opened June 26, 1893.

The lowest bid, that of John Hogan, $8,250, being considered too high, was recommended to be rejected.

Q. 15.

PRELIMINARY EXAMINATION OF MISSISSIPPI SOUND, OUTSIDE OF THE RANGE OF ISLANDS OFF THE MISSISSIPPI COAST, WITH A VIEW OF MAKING AN ENTRANCE FOR VESSELS (SHIP ISLAND HARBOR).

UNITED STATES ENGINEER OFFICE,
Mobile, Ala., May 9, 1893.

GENERAL: In compliance with instructions contained in circular letter of July 14, 1892, I have the honor of submitting the following report upon the examination of "Mississippi Sound outside of the range of islands of the Mississippi Coast, with a view of making an entrance for vessels" provided for in river and harbor act approved July 13, 1892. Inquiry elicited the information that this referred to deepening the channel into Ship Island Harbor. The main channel now has a depth of 22 feet on the crest of the bar. The depth desired is 24 feet. This depth can be obtained by dredging * * * and probably the channel thus obtained would maintain itself, as there seems to be a gradual, though slow, deepening from natural causes.

The bar is composed of coarse, compact sand and the distance between the 24-foot curve inside and out is very short.

One hundred and one vessels aggregating 79,883 tons loaded in this harbor with lumber during the fiscal year ending June 30, 1892, and the number has been increasing for a number of years.

Of the vessels mentioned, fourteen would have loaded to 23 feet and more if the depth of water had permitted. The amount of money that would be annually saved to present commerce by the proposed improvement would not be less than $37,000. The harbor is, in my opinion, worthy of improvement for the reason that the commerce is large and the cost small. Probably three-fourths of the commerce of this harbor is supplied by the Pascagoula River Mills, which are probably more interested in the Horn Island Pass, which is much nearer, and as they have commenced proceedings to have improvement made there, it would be well to await the result of any examination that may be provided for by Congress before anything is done at Ship Island.

No survey is needed.

A blue print * showing the locality of proposed dredged channel is forwarded herewith.

Very respectfully, your obedient servant,

A. N. DAMRELL,
Major of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

[Second indorsement.]

U. S. ENGINEER OFFICE,
SOUTHWEST DIVISION,
New York, May 15, 1893.

Respectfully returned to the Chief of Engineers.

For the reasons stated by the district officer I think the entrance for vessels into Mississippi Sound worthy of improvement by the General Government.

C. B. COMSTOCK,
Colonel of Engineers, Bvt. Brig. Gen. U. S. A.,
Division Engineer.

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* Not printed.

Q 16.

PRELIMINARY EXAMINATION OF BACK BAY, BILOXI, MISSISSIPPI, NORTH OF THE TOWN OF BILOXI AND UP TO TOWN OF HANDSBORO, WITH A VIEW OF REMOVING BARS.

UNITED STATES ENGINEER OFFICE,
Mobile, Ala., May 10, 1893.

GENERAL: In compliance with instructions contained in circular letter of July 14, 1892, I have the honor of submitting the following report upon the examination of "Biloxi Bay, Mississippi, known as Back Bay, north of the town of Biloxi, up to the town of Handsboro, with a view of removing bars," provided for by act of Congress approved July 13, 1892.

An examination of the bay, ordered by circular letter of July 31, 1884, was made during that year, and report is contained in Annual Report of the Chief of Engineers for 1885.

The opinion was then expressed that the bay was not worthy of improvement on account of the estimated cost, $140,000, and the small amount of commerce to be benefited. Since that time a portion (and properly the first) of the improvement, dredging a channel through the bar at the entrance of Biloxi Bay to a depth of 8 feet, at an estimated cost of $55,000, has been successfully accomplished for less than the estimate.

A reëxamination has been made and I am still of the opinion that the Back Bay of Biloxi is unworthy of improvement until the channel through the "Biloxi Bay Mud Flats," or more properly "Deer Island Flats" (marked 4 in the above-mentioned report) which lies between Back Bay of Biloxi and both Biloxi Bay and Mississippi Sound, has been cut, this being the second step in a methodical improvement of the waterway.

This cut is referred to in a report on an examination of Biloxi Bay made in 1882, provided for by the third section of the river and harbor act of March 3, 1881, contained in the annual report of the Chief of Engineers for 1882. * * * It was stated that probably the dredged cut would not be permanent.

* * * * * * *

The reason for opinion expressed is, that there is as great a depth of water now over the bars in the Back Bay as exists on the bar at the outlet.

* * * * * * *

The annual amount of commerce to be benefited by the improvement would be about $500,000 in value, consisting of lumber, bricks, charcoal, clay, and general merchandise.

The annual saving to commerce by the improvement would not probably amount to $10,000.

The report of Lieut. E. E. Winslow, Corps of Engineers, by whom the examination was made and a blue print,* showing the locality, are transmitted herewith.

Very respectfully, your obedient servant,

A. N. DAMRELL,
Major Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

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*Not printed.

[Second indorsement.]

U. S. ENGINEER OFFICE,
SOUTHWEST DIVISION,
New York, May 16, 1893.

Respectfully returned to the Chief of Engineers.

For the reasons stated by the district engineer I do not think the Back Bay at Biloxi at present worthy of improvement by the General Government.

C. B. COMSTOCK,
Colonel of Engineers, Bvt. Brig. Gen., U. S. A., Division Engineer.

REPORT OF LIEUT. E. EVELETH WINSLOW, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Mobile, Ala., September 20, 1892.

SIR: I have the honor to submit herewith, my report of the preliminary examinations of the "channel at mouth of Old Fort Bayou, Mississippi," and of "Biloxi Bay, Mississippi, known as Back Bay, north of the town of Biloxi, and up to town of Handsboro, with a view of removing bars." These examinations were made in accordance with your orders to me, dated September 4, 1892.

The examinations of Old Fort Bayou and of the Back Bay of Biloxi were separately mentioned in the order, but as the bayou flows into the Back Bay, and as the most important obstruction to the bayou channel is a bar in the Back Bay, the examinations are grouped in this report.

The Back Bay of Biloxi is about 10 miles long with an average width of about 1 mile, the longer dimension being nearly east and west. It is separated from Biloxi Bay proper by the bridge of the Louisville and Nashville Railroad, containing a draw with a clear opening of about 60 feet. The Back Bay for about 1 mile at each end is open and free from islands, but the intervening portion is strewn with them, these islands all being low and marshy and thickly covered with marsh grass.

There are in the Back Bay the following channels:

1. A channel from the draw northward to the mouth of Old Fort Bayou.
2. A channel from the draw westward to the open part known as "Big Lake." Here this channel divides, one branch leading into Biloxi River, the other through Cranes Neck into Bernard Bayou, and thence to the town of Handsboro.

There is also a third channel leading out of the second to the west of Bernards Island and passing around north of that island and of the central shoal in the mouth of Old Fort Bayou. This was formerly an important passage and is shown on the Coast Survey charts, but it has recently become so closed up near its eastern extremity as to be navigable only by small schooners. It is connected with the channel proper of Old Fort Bayou by a passage over the central shoal only 3 feet deep at mean low water. The approximate positions of these channels are shown by broken lines on the accompanying map. The most important bars and shoals are also indicated, the dotted lines representing approximately the position of the 6-foot contours.

The topography of this map is taken from the Coast Survey charts, there having been no change of importance in this respect since the charts were printed. The depths (given in feet) are from our own soundings, as there have been many changes since the surveys for the Coast Survey charts and even since the examinations made under the direction of this office in October, 1884. The depths given are all referred to the plane of mean low water at Biloxi, but in winter, during the continuance of the northers, the water in the Back Bay falls considerably below this level, reducing the available channels over the bars to perhaps 2 feet less than those shown on the map.

The navigation of the above-mentioned channels is impeded by bars as follows:

A mud flat occupying a large area north of the bridge and having prolongation in four directions; one connecting it with Bernards Island to the west; one extending southward to the bridge crossing the west channel about 250 yards west of the draw, available depth, 7.5 feet at mean low water; one prolongation extending eastward across the channel to old Fort Bayou, available depth, 7 feet at mean low water; one prolongation extending northward into the mouth of Old Fort Bayou; here it assumes the form of a crescent-shaped shoal separating two deeper channels, and is prolonged to the eastward in a marshy island. Across the eastern end of this shoal, near the island, is a passage connecting the two channels 3 feet deep at mean low water. There is a small bar extending northward from the western extremity of Old Fort Point to the central shoal, reducing the depth of the bayou channel at the crossing to 6.5 feet at mean low water. South of the bridge there is a large mud vation of the improvement. Fifty-five and one-half miles from the mouth up were improved in accordance with the adopted project. Fifty and one-half miles of river, up to Wheats Fields, were improved for a 100-foot-wide channel, and fifty miles of river, from Wheats Fields to Columbia, Miss., have been partially improved. From Columbia to Jackson the river has been partially improved by contract. No other work has been done on that section since, and it remains in about the same condition.

The condition of this section of the river on June 30, 1893, is such as to allow light-draft boats to navigate from the mouth, at the Rigolets, Louisiana, to Wheat Fields, Mississippi, 106 miles, all the year; from Wheat Fields to Columbia, Miss., 50 miles, on a 6-foot rise, and from Columbia, Miss., to Jackson, Miss., 169 miles, on a 7-foot rise, and then it is dangerous.

The benefits that are derived by the improvements of this section of the river are greater security to navigation between New Orleans, La., and Columbia, Miss., and other towns and settlements situated on the river, and reduced rates of freights and insurance on merchandise and produce.

Large tracts of rich and valuable bottom lands have been reclaimed by the improvement and are now being cultivated.

It is proposed to apply any appropriation that may be made for the fiscal year ending June 30, 1895, to continuing the improvement of the river for a 2-foot channel at low water between Columbia and Jackson.

It is also proposed to apply any appropriation that may be made for the fiscal year ending June 30, 1895, for deepening the channel over the bar at the mouth of east Pearl River and to dredging a channel 12 feet deep at mean low water, so far as the funds will permit.

Owing to caving banks and shifting of the channel, the improvements so far made and contemplated are not permanent. An annual expenditure of $5,000 will be required to maintain the river in the condition contemplated by the plan of improvement.

Money statement.

July 1, 1892, balance unexpended	$11,862.77
Amount appropriated by act approved July 13, 1892	15,000.00
	26,862.77
June 30, 1893, amount expended during fiscal year	3,902.33
July 1, 1893, balance unexpended	22,960.44
Amount (estimated) required for completion of existing project	20,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1895 Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	20,000.00

COMMERCIAL STATISTICS.

Comparative statement of vessels employed on Pearl River, below Jackson.

Class.	1893.		1889.	
	No.	*Tons.*	*No.*	*Tons.*
Steamboats	11	1,400	9	1,100
Schooners	61	25,000	64	25,600
Lighters and flatboats	22	1,300	16	1,000
Total	94	27,700	89	27,700

PRELIMINARY EXAMINATION OF CHANNEL AT MOUTH OF OLD FORT BAYOU, MISSISSIPPI.

UNITED STATES ENGINEER OFFICE,
Mobile, Ala., May 11, 1893.

GENERAL: In compliance with instructions contained in circular letter of July 14, 1892, I have the honor of submitting the following report upon the examination of "channel at the mouth of Old Fort Bayou, Mississippi," provided for by act of Congress, approved July 13, 1892.

The bayou enters the Back Bay of Boloxi at the eastern end, is about 16 miles long from the mouth to the head of navigation, with an average width of 100 feet and available depth of 9 feet, except at its mouth, where a bar limits the depth to 6.5 feet on the crest.

The improvement desired is to deepen the bar to 8 feet.

In my opinion the bayou is not worthy of improvement until a channel has been cut through the flats separating Back Bay and Biloxi Bay, for the reason that the present depth is about equal on both bars.

* * * The annual saving to present commerce would be very small unless the cut above mentioned should be made.

The report of Lieut. E. E. Winslow, Corps of Engineers, U. S. Army, by whom the examination was made, is contained in his report upon examination of Back Bay of Biloxi transmitted with report upon that waterway.*

Very respectfully, your obedient servant,

A. N. DAMRELL,
Major Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

[Second indorsement.]

U. S. ENGINEER OFFICE,
SOUTHWEST DIVISION,
New York, May 16, 1893.

Respectfully returned to the Chief of Engineers.

For the reasons stated by the district engineer, I am of opinion that this locality is not worthy of improvement by the General Government.

C. B. COMSTOCK,
Colonel of Engineers, Bvt. Brig. Gen., U. S. A.,
Division Engineer.

Q 18.

PRELIMINARY EXAMINATION OF BAR AT THE MOUTH OF WOLF RIVER, MISSISSIPPI.

UNITED STATES ENGINEER OFFICE,
Mobile, Ala., May 11, 1893.

GENERAL: In accordance with instructions contained in circular letter of July 14, 1892, I have the honor of submitting the following report upon the examination of the "Bar at the mouth of Wolf River, Mississippi:"

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*See page 1785.

Wolf River is a small stream, with an average width of 150 feet, depth of 10 feet, and navigable for about 20 miles above its mouth. It flows into Bay St. Louis, at the northeastern end.

The bar at the mouth is 1 mile long, between 7-foot contours, with a depth of only 4½ feet on the crest.

A channel of 7 feet is desired through the bar, which can be obtained by dredging, * * * with chances in favor of a rapid filling, owing to the constant change in location and in depth of the natural channel going on.

The present commerce of the river, consisting of lumber, charcoal, brick, and cordwood, is small, and apparently growing less. I am, therefore, of the opinion that the river is not at present worthy of improvement.

The report of Lieut. E. E. Winslow, Corps of Engineers, U. S. A., by whom the examination was made, is transmitted herewith.

Very respectfully, your obedient servant,

A. N. DAMRELL,
Major Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

[Second indorsement.]

U. S. ENGINEER OFFICE,
SOUTHWEST DIVISION,
New York, May 16, 1893.

Respectfully returned to the Chief of Engineers.

For the reasons stated by the district officer I am of the opinion that this locality is not worthy of improvement by the General Government.

C. B. COMSTOCK,
Colonel of Engineers, Bvt. Brig. Gen. U. S. A.,
Division Engineer.

REPORT OF LIEUT. E. EVELETH WINSLOW, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Mobile, Ala., September 20, 1892.

SIR: I have the honor to submit herewith my report of the preliminary examination of the "Bar at the mouth of Wolf River, Mississippi," made in compliance with your order dated September 4, 1892.

Wolf River flows into the northeastern end of Bay St. Louis and is navigable for about 20 miles above its mouth, average width 150 feet, available depth 10 feet. The banks are generally low, marshy, and free from overhanging trees.

At the mouth the depth of the river decreases, as the river suddenly widens into the bay and the channel follows a narrow and crooked course across a large and shallow mud flat formed apparently by the deposit of the river sediment. This flat contains a large number of snags and sunken logs brought down by the river.

At first the channel continuing in the direction of the river flow at its mouth extends for about 500 yards in a direction generally southwest between the shoaler part of the mud flat and the marshy island to the north, the depth gradually decreasing to 5 feet at mean low water. Thence a depth of but 4.5 feet can be carried for about 200 feet through a slight depression in the mud flat in a direction about due north. Here there is another sharp turn in the channel, which again follows a southwest course, gradually increasing in depth until it is lost in the deep water of the bay. The whole length of channel from the mouth to the 7-foot contour of the bay is about one mile and from what can be learned this portion of the channel seems to be constantly varying both in position and depth. The commerce of the river seems to be small, consisting of lumber, charcoal brick and cord wood. One brick kiln and three saw mills are located on its banks. Of the saw mills but one was in operation at the time of the examination, the second had been lying idle for a considerable time and the owner of the third was settling up his business preparatory to removing elsewhere, the cause being the difficulty of obtaining timber. The timber lands along the upper part of the river are said to have been bought up largely by a party of speculators, who by abnormally increasing the price of this land are seriously interfering with the lumber business of the lower part of the stream.

About 2 miles above the mouth there is an opening from the river into a small stream called Bayou Delile (De l'ile) on charts, which has also a separate, but not navigable, opening into the bay. On the bayou, a short distance above this junction, is the small settlement of Delile. At this point are owned 6 small schooners, of from 5 to 18 tons, which carry on a part of the commerce of the stream.

At this junction are situated 2 of the above mentioned saw mills, the third being about 1 mile above. Just above the last mill a movable boom with a small opening has been constructed across the river, and it was stated that only once or twice a month was it necessary to move the boom so as to allow vessels to pass, small skiffs and row boats passing through the opening in the boom.

A dredged channel across the mud flat at the mouth would cost probably * * * a sum apparently out of proportion to the commerce of the stream, and besides there is every indication that such a channel would rapidly silt up again.

I would recommend, therefore, that the river be considered not worthy of improvement by the Government.*

Very respectfully, your obedient servant,

E. EVELETH WINSLOW,
Second Lieutenant of Engineers.

Maj. ANDREW N. DAMRELL,
Corps of Engineers, U. S. A.

Q 19.

PRELIMINARY EXAMINATION OF BAR AT THE MOUTH OF JORDAN RIVER, MISSISSIPPI.

UNITED STATES ENGINEER OFFICE,
Mobile, Ala., May 11, 1893.

GENERAL: In accordance with instructions contained in circular letter of July 14, 1892, I have the honor of submiting the following report upon the examination of the "bar at the mouth of Jordan River, Mississippi."

This is a small river with about 16 miles of navigable length, a least channel depth of 10 feet, emptying into the northeastern extremity of Bay St. Louis. It has a number of tributaries navigable for short distances.

The bar at the mouth has a depth on the crest of about 5.3 feet, and about 2,000 feet between 7 feet contours, and is composed of mud and sand overlaid by a compact layer of sand and shells.

The channel depth desired is about 8.5 feet at mean low water.

The improvement can be obtained by dredging and the construction of three dams and a small jetty, * * * and would probably be reasonably permanent.

The commerce consists of lumber, charcoal, turpentine, rosin, bricks, and cordwood of a total value annually of $100,000, and susceptible of considerable increase.

The annual saving to commerce by the improvement would not probably exceed $5,000.

In view of the above facts, until the commerce has become of much more importance than at present, I am of the opinion that the river is not worthy of improvement.

The report of Lieut. E. E. Winslow, Corps of Engineers, U. S. Army, by whom the examination was made, and a blue print* showing the locality, are transmitted herewith.

Very respectfully, your obedient servant,

A. N. DAMRELL,
Major, Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

[Second indorsement.]

U. S. ENGINEER'S OFFICE,
SOUTHWEST DIVISION,
New York, May 16, 1893.

Respectfully returned to the Chief of Engineers.

For the reasons stated by the district officer, I am of opinion that this locality is not worthy of improvement by the General Government.

C. B. COMSTOCK,
Col. of Engineers, Bvt. Brig. Gen., U. S. A.,
Division Engineer.

REPORT OF LIEUT. E. EVELETH WINSLOW, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Mobile, Ala., September 20, 1892.

SIR: I have the honor to submit herewith my report of the preliminary examination of the "bar at the mouth of Jordan River, Mississippi," made in compliance with your orders, dated September 4, 1892.

Jordan River empties into the northeastern end of Bay St. Louis, Mississippi. It is navigable for about 16 miles, with a least channel depth of 10 feet, and is of sufficient width for navigation. The banks are low and marshy and free from overhanging trees. It has a number of tributaries navigable for short distances, two of which—"Rotten Bayou" and Bayou Le Croix—seem to have some commercial importance. At its mouth the river separates into two well-marked channels, with a shoal between, the two channels uniting again as they merge into the deep water of the bay. The north channel is quite narrow at its western end, but opens out quite wide at its eastern. It has a least depth at mean low water of 5.3 feet, and is about 2,000 feet long between 7-foot contours. The south channel is narrow throughout, has the same least depth as the other, and is about 1,500 feet long between the 7-foot contours. The bottom of both channels and the intermediate shoals seem to be composed of a rather soft mixture of mud and sand, overlaid by a harder layer of sand and pulverized shells. Along the whole of the south channel this upper harder layer is quite thick and forms almost a complete covering, while in the north channel this layer is thinner, and, at places, is entirely absent. Schooners prefer, therefore, the north channel, which, while longer, has however a softer bottom through which they are able to force their way by poling and kedging even with a draft of 6 inches more than the available depth at the time. There are but two points in this north channel where this upper layer is sufficiently hard and thick to give much trouble to vessels thus forcing their way. The accompanying sketch shows the approximate position of these channels and bars. The topography is taken from the Coast Survey charts, the depths from our own soundings. The depths mentioned above and shown on the sketch are all referred to the plane of mean low water; but during the continuance of the northers in winter the water sometimes falls for weeks at a time as much as a foot and a half below this level. The regular tidal rise is almost insignificant, amounting at most to only a few tenths of a foot. The depth required by the commerce of the place is 7.0 at an ordinary stage, equivalent, therefore, to about 8.5 feet at our plane of mean low water. This is about all that can be carried in the channel of the bay proper through the draw, and into the Mississippi Sound.

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* Not printed.

The river water is remarkably clear, very free from sediment, its mouth gives evidence of very slow growth.

The exports of the river consist of lumber, charcoal, turpentin wood, and bricks. Situated on the banks, either of the river i taries, are two small shipyards, one brickkiln, and five sawmills.

There are also the two settlements of Kiln and Stockdale. T from 8 to 32 tons are owned along the river and are engaged in it of vessels from New Orleans also make regular trips to the river.

The total value of the commerce is about $100,000 per year.

I would recommend that if the improvement of the stream be the following plan be followed:

To close up Cut-off Bayou, Bayou "Jean et Pierre," and the sr the island at the mouth of the river; to build a small jetty in p island across the beginning of the north channel, and to aid the channel thus produced by dredging.

* * * * *

Very respectfully, your obedient servant,

E. EVELET
Second Lieuten

Maj. ANDREW N. DAMRELL,
Corps of Engineers, U. S. A.

Q 20.

PRELIMINARY EXAMINATION OF PEARL RIVER FROM LAKE BURNSIDE, MISSISSIPPI.

UNITED STATES ENGINEER
Mobile, Ala.,

GENERAL: In compliance with instructions contai letter of July 14, 1892, I have the honor of submittin report upon the examination of "Pearl River, Mississip Lake Burnside."

The improvement has already been made, or is und Pearl River, from the mouth up to Edinburg, a distanc and it is desired to extend the improvement about 37 n

The character of this section of the river compare that below Edinburg, and can be improved in the sa the same kind (high water) of navigation at a small cos

The obstructions consist of snags, overhanging trees, one bridge.

* * * * * *

There is no apparent reason for going beyond Yates improvement.

The distance from Yates Bridge to Lake Burnside, a about 2,000 feet long by 300 feet wide, fed by springs, w tion with the river at low water, except by narrow slou dense cypress swamp, is about 4 miles * * * and was reached would not be as accessible to the surround the bridge.

The improvement would give water transportation t now have to haul their products and stores long dista ble roads, to and from the nearest railroad, and then pa freight.

The value of the commerce to be benefited annually b ment is estimated at about $300,000.

The annual saving to commerce from the improveme at $25,000.

miles.

I am of the opinion that this section of the river is worthy of improvement up to Yates Bridge for the following reason:

It is a portion of a long and important river route.

The cost of the improvement and maintenance is small and the benefit to commerce considerable in comparison.

Very respectfully, your obedient servant,

A. N. DAMRELL,
Major, Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

[Second indorsement.]

UNITED STATES ENGINEER OFFICE,
SOUTHWEST DIVISION,
New York, May 16, 1893.

Respectfully returned to the Chief of Engineers.

For reasons stated by the district officer I am of opinion that this locality is worthy of improvement by the General Government up to Yates Bridge.

C. B. COMSTOCK,
Colonel of Engineers, Bvt. Brig. Gen., U. S. A.,
Division Engineer.

Q 21.

PRELIMINARY EXAMINATION FOR DIVERSION OF PEARL RIVER NEAR JACKSON, MISS., THROUGH TANYARD BRANCH.

UNITED STATES ENGINEER OFFICE,
Mobile, Ala., May 9, 1893.

GENERAL: In compliance with instructions contained in circular letter of July 14, 1892, I have the honor of submitting the following report upon the examination of Pearl River, near Jackson, Miss., to determine whether it would be advantageous to divert the river from its present channel so that it would flow through what is known as "Tanyard Branch," and if so, if it is feasible, and what it would cost to divert it.

"Tanyard Branch" is a cut-off of the Pearl River near Jackson, apparently in course of formation. The distance by the river is 5½ miles and by the cut-off is about 1¼ miles. Water passes through the cut-off when the stage is 4 feet above low water.

The fall from the head of the cut-off to its foot at low water is estimated at about 7 feet.

The advantage to be gained by turning the river through the cut-off, so far as river interests are concerned, would be 1¼ miles of good navigation in place of 5½ miles of river that has always given more or less trouble on account of its shifting bank and bed.

The advantage to corporation interests would be the saving of an iron county bridge and turnpike, and the track of the Alabama and Vicksburg Railroad from threatened damage by washing banks, and an improvement of the health conditions of Jackson and the surrounding country. In my opinion the work is not worthy of the expenditure that would be necessary by the General Government, because the cost would be considerably more than would be warranted by the advantage to be gained by the river interests.

The work is feasible. * * * Should the cut-off continue to enlarge, at some future time it may be necessary to carry out the work in connection with the preservation of the improvement of Pearl River between Carthage and Jackson.

Very respectfully, your obedient servant,

A. N. DAMRELL,
Major, Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

[Second indorsement.]

U. S. ENGINEER OFFICE,
SOUTHWEST DIVISION,
New York, May 15, 1893.

Respectfully returned to the Chief of Engineers.

For the reasons stated by the district officer, I do not deem the locality worthy of improvement by the General Government.

C. B. COMSTOCK,
Colonel of Engineers, Bvt. Brig. Gen., U. S. A.,
Division Engineer.

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